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THE DECLARATION OF THE RIGHTS OF MAN

The Lord shall fight for you, and ye shall hold your peace—Ex. 4 : 14.

THE complex and difficult resolutions tentatively formulated by Mr. H. G. Wells for public debate, have for their ultimate object the replacement of the existing chaotic political, economic and social conditions by a new world order. For the achievement of this very laudable and the most desirable object, he has invented a new machinery called the Declaration of the Rights of Man, somewhat analogous to its great historical forbears. It will be remembered in this connection that the Red Swede, Miles Bjornstam in Main Street once declared, "I am about the only man in Johnson County that remembers the joker in the Declaration of Independence about Americans being supposed to have the right to 'life, liberty and the pursuit of happiness'." We are perfectly prepared to believe that Mr. Wells and the eminent gentlemen associated with him, who propose to embark upon the somewhat perilous adventure of evolving permanent peace and harmony among mankind, do not themselves suffer from any malignant taint of national passions and prejudices, and that they possess the manly gifts of an international mind and universal sympathy, capable of seeing inspired visions of the lost Paradise, which, by the zealous and solid co-operation of the

forward nations, they evidently hope to recapture and plant somewhere in Europe or America, radiating sweet love and divine contentment to the remote corners of the world. But surely none of the sponsors of this new movement can have any reasonable faith in the objective existence of a Paradise, which, they know only too well, resides in the human heart, from which, however, it has been successfully banished by war-minded religions, pestiferous imperialistic impulses and the most baneful racial ideologies, together forming the most impious products of our sublime culture and competitive civilization. In the prefatory note setting forth the aims and objects of his new Declaration, Mr. Wells in his inimitable cheerful optimism explains that, if the mental confusion and political incompetence of the existing governments were removed, the advent of universal peace and lasting happiness would be rendered easy and natural, provided their foundation is laid on the decalogue he has propounded.

We admire Mr. Wells' courage. We honour his conviction. He has set before himself and his colleagues a task which would have shockingly baffled the great Founder of the official religion of their country. However, the world will bless them, if they succeed in assembling under a single white tent all the nations, peacefully and lovingly eating the fat of the land and drinking the dew of heaven, without baring their teeth at each other like belligerent rats. Everyone will agree with Mr. Wells when he says that we must fight against all that Hitler stands for,—violence, cruelty, bad faith, implacable aggression,—and that we must put in its place "a world and nothing less than a world at peace, where men can be free, without fear and so on". The appearance of Mr. Wells in his new character as a politico-ethical evangelist is explained by the fact that he claimed for the novel the powers of regenerating mankind, which he expressed thus, "it is to be the social mediator, the vehicle of understanding, the instrument of self-examination, the parade of morals and the exchange of manners". Where the politician has failed, perhaps the novelist may still succeed. His efforts must be supported by the energy and enthusiasm of all men and women, who approve of his resolutions in their present or in their amended form, though novelists like politicians are men and not giants.

We are not quite sure about the potency of the Declaration of the Rights of Man as a preventive machinery against dangers to international relations, or as an article of social faith for the establishment of non-violence, goodwill, tranquillity and economic progress. The word "Rights" generally implies prerogatives, privileges and immunities, and the individual, social and civic "Rights" have always an astonishingly awkward tendency to transform themselves into the "Rights" of States and Communities, thus giving rise to the principal classes of cases in economic competition in which governments intervene. If we trace the origin of human troubles, we shall discover that they began when primitive man first conceived the idea of possessing things exclusively, and developed the notion of defending his possession as a "Right" and of extending further aggrandisement also as a "Right". The significance and value of "Rights" are purely biological concepts, and their application as an ethical doctrine in the social and political spheres is always understood with consider-

able mental reservation. Far more fundamental to the cause which Mr. Wells and his supporters have proposed to establish, must be a clearer, a deeper and a more humane perception, and an intuitive practice of our duties and obligations toward our fellow-men, more than toward ourselves. Mr. Wells, wearing the wreath of literary supremacy with Mr. Bernard Shaw, is reputed to be a prophet, and it is therefore inexplicable why he has formulated the Declaration of the Rights of Man, while he and every man capable of thinking rationally and justly, must recognise the supreme need for a Proclamation of the Services of Man. How do individuals and nations exercise their rights? Is it or is it not a fact that in endeavouring to use and protect our rights we pretty nearly succeed in restricting the rights of others? Do not nations feel triumphant if, after considerable diplomatic exchanges and political negotiations, they finally succeed in either circumscribing or subordinating the rights of other nations? Do individuals and nations instinctively recognise and maintain the sanctity of their duties and obligations to each other? The fact is that in the case of "Rights", it is exhilarating to claim and protect special interests; whereas in the case of "Duties and Obligations", it is apt to be painful to practise the universalism of Christ. Between "Rights" and "Duties" there is a world of difference, and this difference explains the saying, "In this world there is tribulation."

It seems to us that the principal reason why we emphasise rights is because the spirit of Jehovah is still firmly ingrained in the heart of Christendom, and also because the tyranny of a mechanical civilization has subordinated the spiritual values of human relations. We are not convinced that, after centuries of religious teaching and educational influence, the human mind has become sufficiently righteous, meek and pacific to resist the temptation of abusing individual and national rights. In drafting the clause relating to personal freedom, Mr. Wells observes, "there again I admit difficulties. They centre upon the idea of conscription. It may be objected to the draft Declaration as a whole that it says much about rights and nothing about duties. It may be true that any one, who observes the rights of others to the full extent of the Declaration, has already undertaken very considerable obligations, but that does not dispose completely of this objection". There is an enormous mass of human document in the form of treaties, conventions and understandings establishing national goodwill and cordial relations, besides the Commandments and Injunctions of revealed religions, proclaiming the doctrine of the brotherhood of man and of universal love, and we have witnessed how in the past everyone of these articles of good faith, fellow-feeling and personal rights has been prosperously infringed or circumvented, throwing back society into barbarism and into the worshipping of the Golden Calf. Mr. Wells has not disclosed to us the authority which he proposes to invoke for the due and general observance of his new Declaration, but, if he relies on his ten clauses being received with open arms by mankind as a new Gospel for their temporal salvation, and on their being loyally and cheerfully followed without transgression, for at least a reasonable period, we are afraid that he is making too great a demand upon human nature.

There is a cartoon forming the frontispiece to *The Potwell Inn*, in which the figure is portrayed in the heavy panoply of a knight-errant, holding a mop instead of a lance. If we add a goose-quill to its accoutrements, the caricature might then come nearest to expressing Mr. Wells' present intention, of sweeping away the accumulated wrongs of the world and writing a new charter of human liberties, rights and peace. It would almost seem that the Gods in planning our existence, have deliberately mixed it up with strife and low cunning.

> And Isaac interested the Lord for his wife, because she was barren, and the Lord was interested of him, and Rebekah, his wife, conceived. And the children struggled together within her, and she said, if it be so, why am I thus. And she went to enquire of the Lord. And the Lord said unto her, two nations are in thy womb, and two manner of people shall be separated from thy bowels, and the one people shall be stronger than the other people, and the elder shall serve the younger.

The Lord blessed Jacob. He became the founder of modern diplomacy and science. In the Gospel according to St. John, we read that

> The Jews' passover was at hand, and Jesus went up to Jerusalem. And found in the temple those that sold oxen and sheep and doves, and the changers of money sitting. And when he had made a scourge of small cords, he drove them all out of the temple, and the sheep, and the oxen, and poured out the changers' money, and overthrew the tables.

Even that monumental Embodiment of Love could, in moments of grave provocation, lose temper and take the law into his own hands. Does Mr. Wells suppose that under the dispensation of his new Declaration the world is going to enjoy uninterrupted peace? Practically in all religions, the Lord is conceived as blood-thirsty, either directly engaged in conflicts, or assisting and encouraging His beloved people to wage war, "for the Lord, whose name is Jealous, is a jealous God".

Before the Israelites were led by Moses from Rameses to Succoth, the Lord enjoined him to "speak now in the ears of the people, and let every man borrow of his neighbour, and every woman of her neighbour, jewels of silver, and jewels of gold and raiment". The Lord proceeded to give the Israelites "favour in the sight of the Egyptians so that they lent unto them such things as they required. And they spoiled the Egyptians". There was a manifest need for the Ten Commandments thereafter.

"A world and nothing but a world at Peace" is mere rhetoric, or is a world reduced to the grey level of scientific dullness, and in the very nature of things we can hardly conceive its advent, though the ideal may be both desirable and necessary. The immediate object of Mr. Wells would, however, appear to be to secure for every man protection against the perils arising from individuals or from Governments, and for every nation, a reasonable measure of assurance to achieve its own destiny, freed from external intervention. In discussing measures for the attainment of this reasonable object, we often ignore the fundamental fact that human mind is incalculable and erratic, for it is really composed of separate layers, belonging to different epochs of its evolution, the animal, the savage, the childish and the civilized strata. The first is our inheritance, the second the race has passed through, the third a sort of mixture of the first two, which every individual

experiences, and the fourth is superimposed by the Church, the School and the Society. The extent of the existence and the degree of the activity of the first three layers necessarily depend on the strength and stability of the uppermost crust. In times of stress and crisis, the topmost bed often cracks; and we know the results. Before we proceed to discuss the practicability or otherwise of Mr. Wells' clauses, we must know how he and his distinguished colleagues propose to consolidate this very shaky top layer of the human mind into a Maginot line, withstanding the quakes of the subterranean strata. The foundation of Mr. Wells' Declaration is, in the last resort, the human mind, and, before he sets out to achieve moral harmony in the world, he must assure himself of three things: a deeper understanding based on the knowledge of life should develop sincerity of will; this sincerity of will must purify the heart; and this loving heart must spiritualise personal life. The path to individual freedom and to national peace does not lie through self-righteousness, though it be anointed with "a pound of ointment of spikenard", but lies in our capacity to own mistakes, to compromise differences, and above all rigidly to practise the doctrine, "do unto others as you would be done by". Mr. Wells' Declaration has not vitality enough to survive another international shock, and his resolutions are not likely to dissipate the causes which produce conflicts. We are all convinced that the present campaign against Germany is just and moral, and that the victory of the Allies is absolutely necessary for the independence and sovereign rights of all the smaller European States, and that all the forces of "civilization" should be mobilised for the final overthrow of the spirit of aggression. The Allies hope that the termination of the present war will witness the birth of a new era of uninterrupted peace in the international life of Europe, and possibly Mr. Wells' Declaration is intended to pave the way for its inauguration. We shall co-operate.

Do the ten clauses drafted by Mr. Wells provide a basis for testing the preparedness of the world to receive the message contained in them? Students of contemporary political history must be aware of Clarence Streit's *Union Now* in which, after analysing the causes for the failure of the League of Nations, he has reached the conclusion, "that the only chance for the survival of the world as we know it and as it might be, would be pooling of some part of National Sovereignty and the eventual growth of a universal system of World Government which would be invincible against aggression and which would help against all economic and racial barriers". In examining the proposals for the establishment of a World Federal Union, the Marquess of Lothian in his book, the *Ending of Armageddon*, has drawn attention to the principal difficulties of a coalition between totalitarianism and democracy, the national pride in giving up National Sovereignty, and the colonial problems involving the political and economic control over other people. The politico-economic doctrines which we have drafted below would, in our judgment, constitute a measure of the willingness of nations to consider them as the basis for evolving a new code of international morality, and the first step in this direction must obviously be a complete demilitarization of religion and the annihilation of the war-mindedness of politicians.

1. We will share on an equitable basis the raw materials of the world in common with other nations, and will always abide by the decisions once accepted honourably by ourselves and the members of the Federation.

2. We will scrupulously respect the religions, customs, manners and other social practices and ceremonial rituals of every group or community of people to whatever cultural level they may belong, and we agree that interference with their right to follow their own observances, shall entail forfeiture of further participation on our part in the benefits of the Federation. We will seek the aid of liberal education rather than that of religion in reforming such practices as *sati*, human sacrifice and head-hunting.

3. We will interfere with the politics of no country, big or small: we respect its sovereign right to enjoy any form of government it may choose; where, however, its activities are apprehended to threaten the integrity of the Federation, the other members shall agree to join in imposing an economic boycott on the offending nation.

4. We will hold no community in economic or political subjection or vassalage, to whatever colour and civilization they may belong: we will agree to develop the material resources of any country and to organise its industrial possibilities only when invited to do so, and that strictly on a contract basis, without creating vested interests.

5. We will relinquish all exclusive privileges in respect of the great trade routes of the world, which shall be free for all, and which shall be jointly protected and maintained strictly for mercantile and traffic purposes, and which shall not be allowed to be used for carrying fighting vessels of any description.

6. We will export our industrial and agricultural products on the basis of a voluntary understanding between ourselves and the importing country, refraining from producing goods far in excess of home consumption so as to obviate trade rivalries and business competition.

7. We will spend out of our public revenues such sums as may be required only on those implements which may be employed for the preservation of domestic peace and order, and we solemnly bind ourselves to eschew all armaments capable of being employed against other nations.

8. We will acquire no fresh territory, except such vacant and uninhabited tracts as may be freely and willingly assigned to us by the unanimous consent of the Federation, in order to provide for our increasing demands. The boundaries limiting such grants shall on no account be infringed by us, and such countries shall not be used for extending our sphere of influence into the neighbouring territories.

9. We will establish a Federal Bank for controlling international currency, credit and exchange, and the Bank shall have power to refuse credit to any power infringing the articles of the Federation or engaging in a conflict with another federating member.

10. We will re-shape, re-adapt and re-construct our respective economic, industrial, racial, religious, cultural, social and political life in accordance with the general aims and purposes for which we establish the Federation, and in the process of re-arrangement we will so order individual life that, while it maintains absolute yet restrained freedom in all spheres of its activity, it is deprived of its potency for aggression abroad and terrorism within.

11. We will give up all existing monopolies and tariffs; we will relinquish our rights to hold colonies, dependencies, protectorates and mandated territories: we will arrange them on a fresh basis of

equity and justice such as may be determined by the Federation, subject to the doctrine of self-determination on the part of the colonies, dependencies, protectorates and mandated territories.

12. We will refer to the plenary session of the Federation all those classes of cases where international disturbances may be apprehended, such as, population problems, commercial policies, credit, currency and capital problems, transportation and raw material problems, diplomacy in relation to political and economic relations, political and social upheavals arising from dangerous ideologies and their reactions. We will uphold the supreme authority of the Federation in the settlement of these and other related problems, whose power to enforce its decision shall reside in the willingness of other members to boycott the offender socially, economically and politically.

We are perfectly aware that we are not sufficiently pure at heart and meek in spirit even to look at any of these propositions, but we do not anticipate a better fate for Mr. Wells' Declaration of the Rights of Man. We have put forward the raw material out of which the legal and constitutional authorities might produce the general framework of a World Federation for discussion at a constituent assembly of the representatives of nations, after the happy termination of the war.

BARODA STATE FISHERIES

THE *Annual Report of the Department of Fisheries*, Baroda State, deals with the history of the fishery activities in the State from 1909, but it was not till 1936 that a Department of Fisheries was established and Mr. S. T. Moses appointed its Director in September 1937. Though the *Report* under review is full of details and constructive proposals, it is essentially of the nature of a preliminary report indicating the present state of fisheries of Baroda, the defects in their working and the difficulties that have to be encountered and overcome before any improvement can be effected. It is reported that the Director made a biological survey of the State and collected data about fish supply at various places. Several industrial experiments were carried out and already the schemes for the establishment of an aquarium and biological station at Port Okha, starting of fish farms at Velan and Balapur, setting up of fish-hatchery at Muldwarka and a permanent fishery settlement at Kotdah (Velan) with an industrial depot for cold storage and curing and a smaller cold storage depot at Okha are under the consideration of the State authorities.

Considering the short period during which the work detailed in the *Report* has been carried out, a good beginning seems to have been made and we hope that in course of time the fisheries of Baroda will assume their proper place in the industrial development of the State. We take this opportunity to offer our congratulations to the Director and his small band of enthusiastic workers.

THE STUDY OF MARINE ZOOLOGY IN INDIA

BY

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IT is unfortunate that our Indian seas, possessing such a rich potential wealth of animal and plant life, should remain a neglected field in Natural History, and that our knowledge of them at the present moment should be poor. No doubt, the study of animals in our seas is extremely interesting and important, but so far very little attention has been paid to them.

Our knowledge of the life in the Indian seas, which is of a diverse character, is very meagre indeed: we know practically nothing about the life-histories, spawning habits, food, rate of growth, migrations, distribution and seasonal variations about some of the most important marine animals, especially those of great economic importance, *viz.*, the fishes. The welfare and prosperity of a fish mainly depends upon its food, and this food, in many cases, consists of the marine planktons, *viz.*, both phytoplanktons and zooplanktons. Plankton-life is one of the most important biological, ecological and economic factors in the sea. As for instance, certain very important food-fishes (*viz.*, the Mackerel—*Rostrelliger sp.* or *Scomber*) feed chiefly on planktons, *i.e.*, mostly on Copepods, which again subsist on the diatoms; and thus it is evident that there is a very close relation between the planktons and many other important organisms in the sea.

Within the plankton-life itself there is so much of seasonal variation, diversity of form and occurrence, vertical migration, etc.; and the density and specific range of planktons are also very variable indeed,—depending upon several factors, among which the primary ones are the quantitative variation of the essential elements such as the silicic acid in the sea-water, which helps in the formation of the silicious skeletons of the diatoms; hydrogen-ion concentration; variations of temperature; sunlight; and salinity. All these factors are of very great importance to the life of planktons. In this connection reference may be made to the important works of Raben (1910), Murray, Moore (1915), Hornell (1923), Gray (1928), Atkins (1932), and others. It is true that in colder seas specific density of particular planktons is greater than that in the warmer seas, yet there is a vast field for work in this very fascinating branch of zoological study in India; and, it is also known that, so far as the number and variety of species are concerned, tropical waters are certainly always richer than the temperate and the arctic seas. In short, the economic aspects of planktons can hardly be overestimated, and it is for this reason and also because of the interrelation of life of other animals in the sea, very extensive investigations are now being done on them, both in the European as well as in American waters. In this connection particular mention may be made of the German Marine Biological Station at Kiel, where lately they have concentrated most of their attention on the intensive and extensive study of the planktons round about their seas.

However, our knowledge of the life-histories of the Indian Planktons is all

due to the earnest labours of Lt.-Col. R. B. Seymour Sewell (1912, 1913, 1926, 1929, 1932, etc.), but there is yet a vast virgin field to be explored. In addition to purely biological investigations of our seas, we must also direct our attention to certain other equally important factors which govern the conditions of life in the seas, *viz.*, the physico-chemical aspects of the water. This has been badly neglected in India, both so far as fresh-water as well as marine animals are concerned, without which our knowledge of the life in the sea would be most imperfect, and at the same time any satisfactory solution as to the life-histories of many of our sea-animals can hardly be achieved. In short, both hydrobiological and hydrographical work is absolutely necessary in order to understand the natural history of the fauna of our seas correctly. All the important factors should be most carefully and scientifically investigated and studied in order to get a correct idea of the rich wealth of animal life in our seas, which is waiting exploitation, and which will ultimately confer inestimable benefit on the vast population of India.

Animal-life in our seas, especially those at the sea-shore, sea-bottom, and also the swimming animals, drifting life (or plank-tons), the boring animals, coral reefs, etc., presents a most fascinating aspect for a systematic study. While there is such a diversified fauna of marine life found within the limits of the Indian shores, our knowledge of them is still imperfect to a degree due to sheer neglect and lack of interest.

It is of utmost importance that, if we really wish to develop and enrich our knowledge of Indian Zoology, we should know all about the structure and the natural history, bionomics, and physiology, of a vast assemblage of life that is present in our own seas, from the lowest to the highest. We should develop, encourage and create an interest in the study of marine zoology of our own country, which has been grievously neglected for such a long time. It is universally admitted that actual study of living marine animals is something far superior to, and more useful than, merely mechanically dissecting and drawing dead marine specimens in the class-room. Apart from the value of mere class-room study of morphology, marine animals are really very important from the point of view of the industries provided by the marine fisheries as well as the various products of very great value from the sea, which will greatly contribute towards the prosperity of our country. As a matter of fact, the whole success and prosperity of the marine fisheries entirely depend upon a complete knowledge of the life-histories of fishes, and it is here that the study of marine zoology can offer us the greatest assistance.

In order to create a real interest in the study of marine animals it is very necessary that the student of Zoology should go to the sea himself, and should actually observe, handle and examine the great variety of the most beautiful animals assembled together and found at the sea-coast; he must study their habits, ecology or bionomics, form and structure, behaviour and physiology on the spot and make his own notes from personal observations, and naturally he would thereby acquire a first-hand knowledge and information, which is the most important part of any scientific study. Such a kind of study is a vital necessity for the development and progress of marine zoology. As

a part of the work of any University curriculum our primary aim should be, first of all, to study thoroughly as many Indian marine types as possible, and then to examine the foreign types for the sake of critical comparison. In order to achieve this end specialists should take up the task voluntarily and engage themselves in working out the typical marine representatives from each class of animals, and a series of monographs should be prepared and published on the same line as the L.M.B.C. Memoirs. Of course, some admirable work has already been done in this direction in the Zoological Research Laboratory at Madras under the able guidance of Prof. R. Gopala Aiyar and also in the form of a series of valuable publications in the *Indian Zoological Memoirs* under the efficient editorship of Professor Karm Narain Bahl of the Lucknow University.

A place for the study of marine zoology should be selected and located at such a situation in India as would be most suitable for the study of marine life with the best of all desired conditions and environment, and at such a place an All-India Marine Biological Station should be established with a proper well-trained research staff, and planned on a research basis in the same way as the one we find at Plymouth, Port Erin, Roscoff, Heligoland, Naples, Kiel and Woods Hole. For this purpose an ideal place will possibly be the Krusadi Island, with, of course, several smaller research sub-stations that should also be gradually established at Madras, Trivandrum, Bombay and Karachi. Undoubtedly most valuable researches could be done at such a station. The whole idea is that the present resources of the Fisheries Department, under the Government of Madras at Krusadai, should be recognised as the nucleus for the future development and expansion of the All-India Marine Biological Station, and we should work together in full co-operation with the Fisheries Department. This would be most economical also, and in this way we shall be saving a lot of unnecessary initial outlay.

Every University in India which provides for training in Zoology should wholeheartedly co-operate with such a Marine Biological Station, and once a year both the staff as well as the senior students (say, the Honours and the Post-graduate) should visit the station, stay there for about 3 to 4 weeks, and study the marine animals in their natural home, and thus obtain a lot of most useful information about them. I should recommend that this should form a compulsory part of the University course for all B.Sc. Honours and the Post-graduate students. At such a place there should also be adequate arrangement for a vacation-refresher-course of lectures on marine animals, which would benefit the zoologists in general, such as we have at every coastal educational centre in Europe and America.

In view of the great diversity of form, structure and usefulness, marine animals are considered more important than the freshwater types, and hence a thorough study of them is absolutely essential in order to raise the general standard of zoological teaching in India. The only way to do it will be for the Universities as well as the Provincial and the State Governments to take a very keen interest and a more active part and a fuller advantage of all the resources existing in a central Marine Biological Station which should co-ordinate the activities of

other smaller sub-stations mentioned above. I would like to suggest that there should be at least one zoological table created and maintained by each University at such a place for research work to be conducted by any member of its staff, and that a generous grant-in-aid should be given by each University as well as the Provincial and State Governments, in addition to a small fee paid by the individual worker himself, as is done in all Western countries for the maintenance of its establishment and upkeep.

ORGANISATION OF INDUSTRIAL RESEARCH*

IT is thought that the occasion of the annual meeting of the Court of the *Indian Institute of Science*, Bangalore, which brings together so many influential representatives of science, industry and the professions, might be profitably utilised for concerting measures to promote industrial research. This may be done with a view, not only to strengthen this class of research in the *Indian Institute of Science*, but also, if possible, to co-ordinate the work done in all parts of the country, and prepare a plan and programme for the coming year.

There are special reasons why stress should be laid on industrial research at the present time and why it would be appropriate for a body like the Court of this Institute to consider this subject. In recent months educationists and business men have been loudly calling for measures to promote industries. The War has cut off supply, or enhanced the prices of chemicals, machinery and other commodities usually imported hitherto, and Government are also hard put to it for obtaining transport, military and other stores.

The question of promoting industrial research has been under the consideration of the authorities of this Institute for over six years. In the latest quinquennial Review, the Irvine Committee have outlined a scheme "to make applied research the first and most responsible duty of the Institute".

The Science Institutes, Universities and Colleges, have been spending considerable sums of money on research, but this is mostly on what is known as *pure research*. Since their activities are not regulated by any all-India Organisation which can speak with authority, there is no co-ordination or regulation of effort among research workers in the country just as there is, for instance, under Government auspices in Great Britain and the Dominions. This often results in duplication of work and waste of energy and money. There is no lack of scientific talent in the country to carry on industrial research or business ability to exploit such researches commercially but they are at present not systematically mobilised to serve the interests of industry.

The importance of application of scientific methods and knowledge to the practice of industries is now universally recognised. Several countries including the Dominions of the British Commonwealth have National Research Councils to organise and supervise work of this description, and recent indications are that the Government of India are also seriously thinking of a move in the same direction.

Until the Government of India find it possible to establish an institution like a National Research Council, it may be necessary to start a small *unofficial Committee* of representative scientists and business men to organise industrial research in War time.

A Committee of three members and three Honorary Secretaries is recommended. Each Secretary may be a leading Scientist or the head of a Science College or Institute.

The first duty of the proposed Committee would be to collect exact information of the kind and amount of research work that is now being done and the expenditure that is being incurred on it in the various educational and industrial centres in the country; then, by correspondence and discussion, to come to an understanding with the scientists and authorities of each centre as to the

* This memorandum prepared by Sir M. Visvesvaraya, K.C.I.E., was forwarded to the members of the Court of the *Indian Institute of Science*, Bangalore, for discussion at the meeting held on 23rd instant. The note contains recommendations which furnish material for a fruitful public discussion which we invite. It seems opportune that Sir M. Visvesvaraya has initiated deliberations in the first instance at the meeting of the Court and we would ask our readers to contribute their views and suggestions which will be gladly considered for publication.—*Ed.*

kind of research work and the character of research problems that would be of great value to their particular area in the present emergency. At least half a dozen University or other groups might be able to co-operate in this way.

In view of War emergency, it is suggested that *applied* research should be preferred as far as possible to *pure research*, and the research problems chosen should be distinctly *industrial* in character.

It is provisionally suggested that the small Committee proposed, be chosen from the front rank of scientists and business men in the country—not necessarily all from the members of this Court—to be entrusted with this responsibility. The election may, if necessary, be conducted by ballot and if the persons so elected consent to take up the work they may be entrusted with the responsibility of co-ordinating and stimulating work in this field, in the country as a whole, for one year, or till the Court meets in March 1941.

The Committee will be expected to prepare a combined plan and programme, as far as possible, after obtaining regional plans and programmes from the various centres of scientific activity in the country. The Committee will claim no authority of any sort, and will attempt no interference with the working of the existing institutions; but its members, by their knowledge, experience, breadth of view and tact, should be able to persuade all centres to co-operate and bring about unity of effort in the cause. In this way it is thought possible to achieve some specific tangible results and supply the vital needs of industry in the coming year.

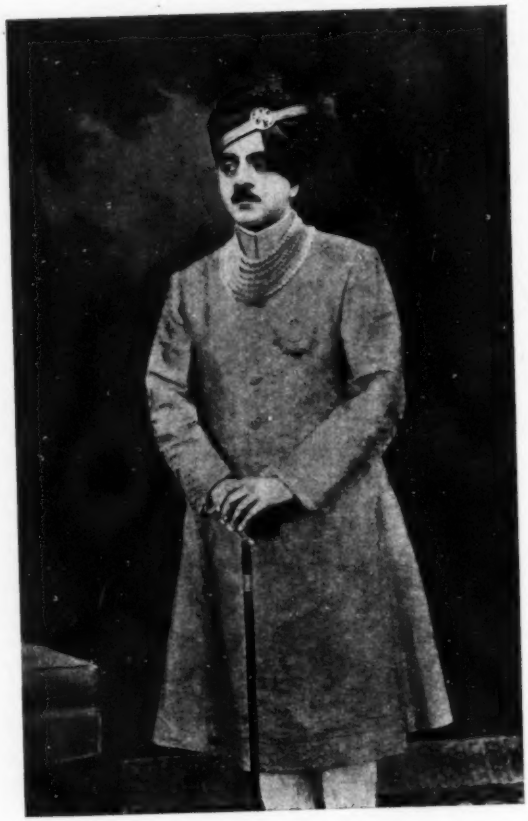
The work to be done in each co-operating centre should not be vague or indefinite but should, if possible, be set down specifically in a schedule. The names of leaders who take the responsibility for results in any centre for one year should be recognised and recorded. This is no time for prolonged discussions or controversies. Whatever can be attempted should be done quickly.

The Central Government may perhaps wish to start an organisation like the National Research Council, themselves. If they step in at any time to regulate those activities with popular support, their co-operation will secure vast advantages; and I am sure, the unofficial Committee will co-operate or instantly make room and unhesitatingly surrender its responsibilities to Government control.

INDIAN FARMING

THE immense amount of research work in Agriculture that has been in progress in India, though admittedly of a high order both from the scientific and from the practical standpoint, has suffered from the drawback that the results have not always reached the cultivator as speedily or as widely as they ought to have. As the extent to which such results reach the countryside and are adopted by the cultivator will form not only the best test of their value but also the justification of the expenditure of money on the work, the criticism assumes great importance and we are glad to note that recently the *Imperial Council of Agricultural Research* has been bestowing a great deal of attention on the ways and means of bridging this gap between the laboratory or the experimental farm and the cutlivator's field, in the most effective manner. One of the first fruits apparently of these endeavours is the Council's decision to replace the well-known journal, *Agriculture and Livestock in India* by a more popular agricultural magazine, which will moreover be issued once a month, unlike the former which was being issued once in two months. The opening number of this new magazine which is styled *Indian Farming* has just appeared and we gladly welcome the publication. Appropriately enough, His Excellency the Viceroy, Lord Linlithgow, contributes a message of good wishes to this further attempt in rural development—a matter which has always been nearest to his heart. We consider it was a wise decision to issue the journal as a monthly publication, so that matters of agricultural interest may be constantly brought before the public eye. The contents of the opening number are well chosen and the presentation leaves little to be desired. New features are also added notably a 'question and answer' section, which should greatly enhance its usefulness. We wish *Indian Farming* a long career of usefulness.

A. K. Y.



HIS HIGHNESS THE LATE YUVARAJA OF MYSORE

OBITUARY

HIS HIGHNESS SIR SRI KANTIRAVA NARASIMHARAJA WODEYAR BAHADUR, K.C.I.E., G.C.I.E., THE YUVARAJA OF MYSORE

A GREAT and charming Prince is dead. The loss to the Royal Family of Mysore is grievously irreparable, and to the people of the State, profoundly sorrowful. Born in June 1888, His Highness was only fifty-two years at the time he passed away, and what makes the sadness the most poignant, is, that the demise took place far away from his home, his family and his devoted people.

Some of the lineaments of the character of this Prince were early discernible in the child. Intelligent beyond his age and endowed with a healthy constitution, he distinguished himself in the Royal School by his industry and diligence, while no instinct of delicacy veiled his rompings. When still of a tender age, he had the misfortune to lose his father, H. H. the late Sri Chamarajendra Wodeyar, in 1894, and his education and training were entrusted to Mr. (now Sir) Stuart Fraser and Mr. P. Raghavendra Rao, under the immediate oversight of the late lamented Maharani. When H. H. the Maharaja was invested with ruling powers in 1902, it was decided to send the young Yuvaraja to the Mayo College at Ajmer, where unfortunately, his education was abruptly terminated owing to severe illness, but soon after he came under the care and influence of Captain Heale.

His Highness the Yuvaraja was a well-travelled man. Early in 1901 he accompanied his illustrious brother on an educational tour to Burma, and in 1908 paid a visit to that most fascinating State, Kashmir, at the end of which he sailed for Japan, though H. H. the Maharaja, for whom the programme was originally arranged, could not proceed owing to threatened famine in the State. His Highness accompanied his brother to attend the Imperial Coronation Durbar at Delhi in 1911,—a year after his wedding with the accomplished and cultured daughter of the late Sir Dalavai Devaraj Urs, one of the foremost noblemen of the State. In 1913 he went to Europe, where he visited practically all the important countries. H. H. the Yuvaraja early discovered that these visits were of such educational value, providing an immense mass of material for close and critical study, that he repeated them several times.

His Highness leaves behind him his great and lamenting brother, his sorrowing wife and a son and three daughters all deeply mourning at the sudden and grievous loss. In this hour of bereavement, we beg to tender to the Royal Family of Mysore our respectful condolences, and we pray that Providence will, in His tender mercy, support and comfort its members in their sorrow.

His Highness had remarkable administrative abilities which found early expression, while being trained in the Maharaja's Private Secretary's Office and later in the administration of Sir M. Visvesvaraya, when he acted as an Extraordinary Member of the State Executive Council. His Highness took a deep interest in all public movements. He was the First Chief Scout in the State, where, under his influence, scouting has become an important activity of all educational institutions. He lent the weight of his support to the cause of the social and political amelioration of the depressed communities in the State. The present prosperous condition of the co-operative movement owes largely to his inspiration and encouragement. There was hardly any organisation of public beneficence and utility, with which he was not personally or indirectly associated.

His gifts of intellect and character were only equalled by his eminent and lovable social qualities. Under the somewhat austere princely demeanour, he wore a sterling human heart. His talents were as varied as they were strong. The Prince was an excellent horseman, distinguished himself in all manly sports; was a polished public speaker; a great lover of books and a passionate patron of music of which he was no mean exponent.

Mysore has lost a lovable Prince, sagacious, generous and enlightened.

To H. H. the Maharaja and to Prince Jaya Chamaraja Wodeyar, we, along with their other subjects, beg to tender our respectful and heartfelt sympathies.

LETTERS TO THE EDITOR

2-N¹-Sulphanilamidothiazol in Plague Infection

Since the middle of last year, Mr. K. Ganapathi, a Lady Tata Memorial scholar, working at the Haffkine Institute, has been synthesizing derivatives, particularly heterocyclic derivatives, of sulphanilamide.[1,2,3] Of the 35 compounds synthesized by him, six have been so far tested for their effect on plague infection. One of them, 2-N¹-sulphanilamidothiazol, synthesized by him in collaboration with Dr. B. K. Nandi, has been found to be exceptionally valuable.

For testing the value of this compound in plague infection, we used the method which was developed by one of us (S. S. S.) for assaying the curative value of antiplague sera.[4] This method employs the Haffkine Institute-inbred white mouse as the experimental animal,[5] and an infective dose of about 100 organisms of a constant virulence[6,7] given subcutaneously. For each experiment 50 mice were used. These, after the induction of infection, were divided into five batches of 10 mice each. The administration of the drug was commenced at the same time as the infection in the first batch, 24 hours after infection in the second batch, 48 hours after infection in the third batch and 72 hours after infection in the fourth batch. The fifth batch was used as control. This division into batches was carried out with a view to test the efficacy of the drug at different intensities of the infection. An interval longer than 72 hours between the induction of infection and the commencement of exhibition of the drug cannot be employed as the infected animals begin to die from 72 hours onwards. The drug was given in quantities of 10 mg. twice a day to 40 mg. twice a day for 10 to 20 days per mouse.

In each case an emulsion of the drug was introduced into the stomach of the mouse with a specially made pipette. Each batch of animals under experiment was observed for a period of 35 days.

Four experiments carried out so far show that if the drug in sufficient quantities is given even fairly late in the infection a very large percentage of the mice infected are saved. In its curative action the drug is almost as good as a good antiplague serum and superior to sulphanilamidopyridine.

The results being so good in the mouse, which succumbs to plague infection much more readily than man, there is every expectation that when tried in human cases, as we hope to do soon, the drug will be found to be almost a specific for plague.

S. S. SOKHEY.
B. B. DIKSHIT.

Haffkine Institute,
Bombay,
March 14, 1940.

[1] Ganapathi, K., *Ind. J. Med. Res.*, 1940 April issue (in press).

[2] *Idem., Proc. Ind. Acad. Sci.*, 1940 March issue (in press).

[3] Ganapathi, K., and Nandi, B. K., *Curr. Sci.*, 1940, **9**, 67.

[4] Sokhey, S. S., *Report of the Haffkine Institute* for the year 1938, p. 32.

[5] *Idem., Ind. J. Med. Res.*, 1939, **27**, 341.

[6] *Idem., ibid.*, 331.

[7] *Idem., ibid.*, 363.

Kostanecki Acylation of Orcacetophenone

WITH a view to prepare the hitherto unknown 7-hydroxy-4 : 5-dimethyl coumarin, which cannot be obtained by the Pechmann condensation of orcinol with ethylacetoacetate, which gives 5-hydroxy-4 : 7-dimethyl coumarin,[1] *p*-orsellinic acid (*a*) was condensed with ethylacetoacetate in presence of conc. H_2SO_4, when 7-hydroxy-4:5-dimethyl coumarin-8-carboxylic (*b*) acid was obtained. This was decarboxylated to the required 7-hydroxy-4:5-dimethyl coumarin (*c*). The coumarin structure has been inferred from its non-identity with 7-hydroxy-2:5-dimethylchromone synthesised by the condensation of orcacetophenone dimethyl-ether with ethylacetate and subsequent ring closure of the β-diketone formed. In this connection we thought of getting the same chromone by the Kostanecki acetylation of orcacetophenone.

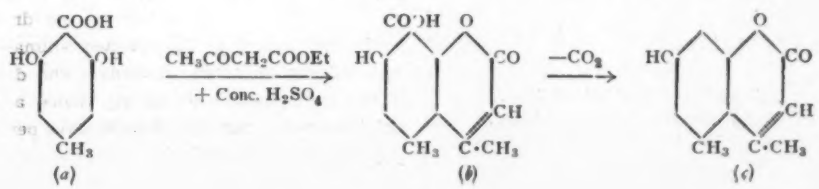
Orcacetophenone on heating with sodium acetate and acetic anhydride gave a product containing two acetyl groups to which the constitution of 7-acetoxy-4-acetomethyl-5-methyl coumarin (I) has been provisionally assigned. This on treatment with conc. H_2SO_4 gave 7-hydroxy-4-acetomethyl-5-methyl coumarin (II) which was deacetylated with sodium hydroxide to 7-hydroxy-4:5-dimethyl coumarin (III), identical with the decarboxylated product (*c*) from the *p*-orsellinic acid condensation described above. Both the products (I) and (II) gave 2:4-dinitrophenyl hydrazones. Product (III) gave fluorescence with alkali, but, the product (II) did not.

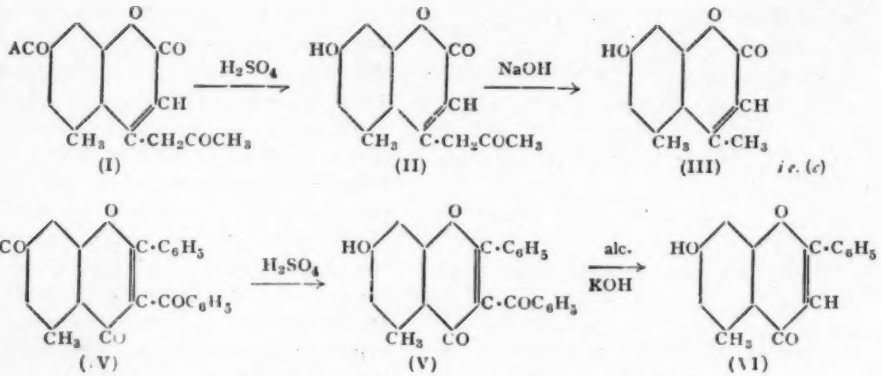
Orcacetophenone monomethyl ether gave on a similar acetylation the methyl ether of (II).

Orcacetophenone and its monomethylether gave on propionylation and butyrylation 4-substituted coumarin derivatives analogous to those described above.

The exclusive formation of a coumarin in the Kostanecki acetylation of orcacetophenone shows that the 5-methyl group in the resorcinol nucleus has a profound influence on the course of the Kostanecki reaction, as resacetophenone gives on a similar acetylation a chromone.[2]

The formation of 4-acyl coumarins in the





(I) (II) (III) (IV) (V) (VI)

Kostanecki acylation has been observed for the first time, though the formation of 3-acyl chromones has been frequently met with. A noteworthy point is the new technique used successfully for the stepwise elimination of *o*-acyl and *c*-acyl groups by the successive use of conc. H_2SO_4 and alkali. H_2SO_4 only removes the *o*-acyl group leaving the *c*-substituted group in the pyrone ring intact. This method appears to be of general applicability and can be also extended to the stepwise elimination of *o*-aroyl and *c*-aroyl groups in the case of flavones—for example—orcacetophenone and its monomethyl ether on benzoylation gave 7-benzoyloxy-3-benzoyl-5-methyl flavone (IV) which on treatment with conc. H_2SO_4 gave 7-hydroxy-3-benzoyl-5-methyl flavone (V). The latter on treatment with hot alcoholic KOH gave 7-hydroxy-5-methyl flavone (VI) of Tambor.[3]

The details will be shortly published elsewhere.

We are extending the application of this method to other cases of aroylation and acylation of *o*-hydroxy ketones.

SURESH M. SETHNA.
R. C. SHAH.

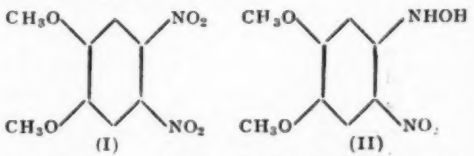
Elphinstone College, Bombay,
Royal Institute of Science,
Bombay,
January 31, 1940.

[1] Collie and Chrystall, *J.C.S.*, 1907, **91**, 1804.
[2] Kostanecki and Rozycki, *Ber.*, 1901, **34**, 102.
[3] Tambor, *ibid.*, 1908, **41**, 796.

Reduction of Dinitro Veratrol with Sodium Sulphide

DINITRO VERATROL (I) is usually reduced to diamino veratrol by Stannous chloride and hydrochloric acid.[1] Whilst trying the reduction by means of sodium sulphide, it was found that under certain conditions nitro veratryl hydroxylamine (II) was formed besides forming a diamino veratrol. This is interesting from the point of view that a partial reduction of only one nitro group in dinitro veratrol can be effected with sodium sulphide. The exact conditions of reaction are as follows:

Dinitro veratrol in absolute alcohol was warmed to about 60° C. and added gradually while cooling (under the tap) and shaking to a warm saturated solution of sodium sulphide. On allowing to stand, a deep red coloured substance separates out. It is filtered, washed with a little absolute alcohol and crystallised from alcohol. This is the sodium salt of the hydroxylamine (m.p. 194° C.).



(I) (II)

The sodium salt is extremely soluble in water and reduces ammoniacal silver nitrate solution. The free hydroxylamine can be liberated by acidifying the aqueous solution (to congo red paper). The free hydroxylamine is orange

brown in colour and crystallises in needles from methyl alcohol; m.p. 110° C.

(Analysis: $C_8H_{10}O_5N_2$ requires C, 44·86; H, 4·67; N, 13·08 per cent.; Found C, 45·02; H, 4·75; N, 12·96 per cent. $C_8H_9O_5N_2Na$ requires N, 11·86 per cent.; Found N, 11·64 per cent.)

B. K. NANDI.

Haffkine Institute,
Parel, Bombay,
February 12, 1940.

[1] Heinisch, M., *J.C.S.*, 1894, **15**, 234.

Sodium Oleate Gels in Pinene

SOAP solutions in aqueous medium have been exhaustively studied by McBain and co-workers.[1] They succeeded in bringing an aqueous solution of sodium oleate into any of the three typical colloidal states, namely, clear oily liquid sol, clear transparent elastic gel and white opaque solid curd at any temperature between 0° and 25°. They also established that soap sol and soap gel are identical in respect of (*i*) electrical conductivity, (*ii*) lowering of vapour pressure, (*iii*) refractive index and (*iv*) concentration of sodium ions but they differ from each other with regard to elasticity and rigidity which are the characteristics of the gel form alone.

Very little work seems to have been done on soap gels in non-aqueous medium. Fischer[2] found that sodium archidate forms a non-syneretic gel in ethyl alcohol. Miss Laing and McBain[3] found that potassium and sodium soaps crystallise in flakes from dry alcohol. On cooling jellies are formed only when sufficient water is present to bring the necessary amount into colloidal solution. Yajnik and co-workers (private communication) have obtained opaque gels by cooling a solution of sodium oleate in turpentine-water and alcohol-water mixtures.

The authors have found that when a mixture of sodium oleate and pinene is heated to 140° aproximately, a clear solution is obtained and this, on cooling, sets to a transparent gel. It has been found that the time of setting of these gels, determined by Flemming's method, decreases as the amount of sodium oleate in the gel is increased and increases with an increase in the temperature at which the gel-forming mixture is allowed to set. By the application of Arrhenius's equation (*cf.* Hurd and co-workers)[4] it has been found that the heat of activation for the setting process is a negative quantity.

The gels exhibit markedly the phenomenon of syneresis which starts not only from the exposed surface of the gel but also from the surface of contact of the gel with the container, so that the gel slips out of the container after some time. The amount of liquid exuded in a given time increases with a decrease in (*i*) the sodium oleate content of the gel and (*ii*) temperature. By the application of the relation

$$h^a = kt$$

(h is the height to which a liquid rises in strips of filter-paper in time t, and a and k are constants), it has been shown that syneresis in the case of these gels obeys the same laws as the imbibition of liquids (negative syneresis, *cf.* Hardy[5]).

A study of the refractive index of several gels set at the same temperature shows that it remains practically unchanged with a change in the sodium oleate content, but with a change in temperature of setting it decreases as the temperature of setting (temperature of measurement being the same as the temperature of setting) is increased, and the relation between the two is practically linear.

MATA PRASAD.
K. N. MATHUR.

Chemical Laboratories,
Royal Institute of Science,
Bombay,
February 14, 1940.

[1] *J.C.S.*, 1920, **117**, 1506; *Proc. Roy. Soc.*, 1921, **98A**, 395.
[2] *Chem. Eng.*, 1919, **27**, 184.
[3] *Koll. Zeit.*, 1924, **35**, 29.
[4] *J. Phys. Chem.*, 1932, **36**, 604.
[5] *Proc. Roy. Soc.*, 1926, **112**, 47.

Formation of Uro-lac

It was suggested[1] that the optical activity of lac is a useful property which could be of considerable value in investigating the reaction of ureas and other substances with lac, which is widely practised with a view to improve the quality of lac in certain directions. Treatment of lac (*Kusum* bleached) in butyl alcohol with urea (10 per cent. on the weight of lac), in presence of anhydrous sodium sulphate and refluxing the reaction mixture at the temperature of boiling water for 24 hours, results in the formation of uro-lac, lac in which urea exists in the combined state. The free and uncombined urea in the reaction mixture is eliminated by repeatedly washing the butyl alcohol solution with water until a portion of the washings does not show any trace of urea as determined by the urease test.

A control experiment without urea was also conducted. Similar sets of experiments were carried out with sclero- and soft-lacs both of which were prepared from *Kusum* bleached lac. The following table gives the figures for the acid value, specific rotation and the total nitrogen of the resulting products:

	Acid value	Specific rotation $[\alpha]_D^{25°C.}$	Total nitrogen %
Lac ..	63·81	54·34	0·05
Lac-*uro* ..	57·94	60·06	1·30
Sclero-lac ..	52·82	47·96	0·00
,, *uro* ..	49·94	47·55	1·12
Soft-lac ..	82·39	49·19	0·00
,, *uro* ..	78·50	51·28	1·32

A decrease in acidity accompanies treatment of lac or its components with urea, while a definite increase in optical activity is registered with urea compounds of lac and its soft component. Treatment of sclero-lac with urea does not appear to bring about any change in its optical activity, although it has entered into combination with about the same quantity of urea. It has been found that under the conditions of the experiment, about 2·8 per cent. of urea can be made to react with lac and its components.

P. S. Sarma.
M. Sreenivasaya.

Department of Biochemistry,
Indian Institute of Science,
Bangalore,
March 18, 1940.

[1] *Curr. Sci.*, 1939, **8**, 165.

Detection of Adulteration in 'Ghee' (Clarified Butter) by the Ultra-Violet Fluorescence Technique

It has long been known that many substances show a fluorescence under ultra-violet light and this property of the ultra-violet light has of late been increasingly utilised in the detection of adulteration in certain drugs, *e.g.*, alkaloids, cod liver oil.[1,2] While engaged in the analyses of cod liver oil in the laboratory, one of us (M.C.M.),* who had considerable experience in the analysis of food materials like butter and 'ghee' at the Sind Government Laboratory at Karachi, suggested that the fluorescence technique could be extended to the field of 'ghee' analysis.

(1) To start with, about 20 to 25 samples of 'ghee' from various sources were purchased from the local market. These were all melted at a low temperature and were exposed simultaneously under the ultra-violet fluorescence lamp (Hanovia-Muir type). A number of common adulterants of 'ghee' such as groundnut oil, cocoanut oil, cotton seed oil, hydrogenated oil (*Dalda vanaspati*), gingelly oil, lard, margarine, tallow, etc., were secured and treated in

* Officer attached to the Chemico-Bacteriological Laboratory, Karachi, on deputation for training at the Biochemical Standardisation Laboratory, Government of India.

the same manner under the ultra-violet lamp, the distance from the ultra-violet ray tube and the time of exposure remaining constant in both cases. The results are indicated in the following table:

TABLE I

No.	Article	Nature of flourescence	Remarks
1	Cow ghee	Deep green	Slight difference in shade
2	Buffalo ghee	,,	,,
3	Groundnut oil	Bright blue	Shades slightly different from each other
4	'Dalda vanaspati'	,,	,,
5	Cocoanut oil	,,	,,
6	Cotton seed oil	,,	,,
7	Gingelly oil	,,	,,
8	Lard	Strong blue	,,
9	Margarine	,,	
10	Beef tallow	Light blue	
11	Mutton tallow	,,	

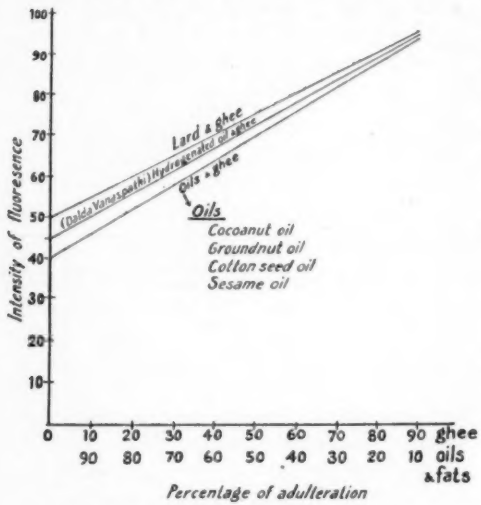
It will be noticed from the above observations that 'ghee', both from cow and buffalo milk, yielded a deep bright green fluorescence which was quite characteristic and differed significantly from the colour and intensity of the fluorescence emitted by all the common adulterants of 'ghee'. This observation naturally indicated that if genuine 'ghee' was mixed with varying proportions of the above adulterants, the resulting adulterated product would be characterised by a mixed green-blue fluorescence, in contradistinction to the deep bright green of the pure 'ghee'.

(2) To determine to what extent the nature and degree of adulteration could be correlated with the intermediate shades of fluorescence between the green on the one end and the blue on the other, a quantity of 'ghee' was prepared† from a sample of genuine and certified butter obtained from a local dairy firm and this was mixed with the different adulterants in proportions varying from 10 per cent. to 90 per cent. and exposed to ultra-violet light under the Hanovia-Muir Lamp in the same manner as described in (1) above. It was noticed that an adulteration extending from 20 per cent. upwards could be easily recognised by the naked eye by watching the gradual preponderance of the blue shade over the characteristic bright green of pure ghee. The difference in the nature and degree of fluorescence in the cases in which the adulterants occurred in proportions of less than 20 per cent., however, was not sufficiently marked to enable any definite opinion to be given. Further, it was realised that this method could only be used as a rough qualitative 'spot-test' for the detection of adulteration of 'ghee' in general, and that this method would not lend itself to accurate quantitative measurement unless the intensity of fluorescence could be measured and expressed in numerical terms.

(3) An attempt was therefore made to measure the fluorescence intensity and to establish a relation between the intensity of fluorescence and the degree of adulteration of genuine 'ghee'. The Pulfrich Photometer with

† The butter was divided into two portions—the first half was turned into ghee at a low temperature while the other half was exposed to a temperature over 100° C. Both samples gave fluorescence (Green) of equal intensity. On chemical analysis the samples gave the following results: B. R. value—42·5; Polenski value—2·2; R. W. value—31·6, indicating that it was genuine ghee.

the attached Analytical Quartz Lamp assembly, was used for this purpose and was found to be of particular advantage in investigating fluorescence phenomena. The samples of pure 'ghee' and the adulterated mixture dissolved in chloroform‡ were placed in 5 mm. glass cell in immediate proximity to the light source employed to excite the fluorescence (*e.g.*, Analytical Quartz Lamp). The fluorescence emitted by the ultra-violet light falling on the samples was then measured by interposing in the light path a red colour filter (L. 1). This filter was found after repeated trials to be the most suitable for our purpose. In the accompanying graph,|| the values obtained for the fluorescence intensity



are plotted against the different concentrations of the adulterated mixtures of ghee with vegetable oils, 'Vanaspati', lard, etc.

From a reference to the graph, it will appear that the intensity of fluorescence is more or less directly proportional to the degree of adulteration and that even minor degrees of adulteration up to 10 per cent. or perhaps to a lesser degree can be recognised by this method. This measure of fluorescence intensity can therefore be employed as a reliable guide in estimating the amount and perhaps the nature of the adulterant. If this technique can be perfected, it will place in the hands of the analysts a method which is not only easy and rapid but is likely to give a much more accurate and reliable information regarding adulteration of ghee and may obviate all the laborious chemical procedures now employed in the detection of adulteration in 'ghee', which is by far the commonest article found adulterated in the Indian dietary.

We wish to acknowledge our indebtedness to Colonel R. N. Chopra, C.I.E., I.M.S. (R.), for placing before us all facilities for work and to Prof. G. Sankaran and to Mr. P. K. Seshan for the use of the ultra-violet ray-Pulfrich Photometer assembly.

M. C. Muthanna.
B. Mukerji.
Biochemical Standardisation Laboratory,
Government of India,
110, Chittaranjan Avenue, Calcutta,
March 5, 1940.

‡ The samples were originally liquefied at 40° C. before putting into the glass cells. As there was a tendency to solidification of the 'ghee' during experiments, a solution in chloroform, which was found to be non-fluorescent, was employed.

|| For convenience of presentation, the actual readings are not plotted but the points are joined to form a smooth line.

[1] Common, R. H. (1937): *Analyst*, Vol. XXII, p. 784.
[2] Iyengar, N. K. and Mukerji, B., *Ind. Med. Gaz.*, Vol. LXXIV, p. 215.

Calcium Utilisation from Green Leafy Vegetables

It is well known that rice is deficient in calcium. Of the many rice varieties (mostly South-Indian) investigated in this laboratory, the maximum calcium content was about 20–25 mg. per cent. Rau and Ranganathan[1] have shown that the quantity of calcium obtained from a rice diet is not more than 0·1 to 0·15 gm. per day while the daily requirement of an adult (according to Sherman) is 0·5 to 0·6 gm. The present investigation was taken up with a view to find how far the green leafy vegetables (which are rich sources of calcium) would supplement a low calcium rice diet.

TABLE I

Name of green	Calcium mgs. %	Anhydrous oxalic acid mgs. %	*In vitro* digestibility % calcium solubilised[7]
Amaranthus gangeticus	2750	9390	34
Amaranthus inamœnus	2947	9023	20
Amaranthus mangostanous	2453	8580	13
Atriplex hortensis	1083	12200	17
Sesbania grandiflora	3231	412	92
Trigonella fœnum græcum	1156	Trace	..
Hibiscus sabdriffa (ordinary variety)	1869	2145	71
Hibiscus sabdriffa (sour variety)	1521	1521	80
Leucerne	2161	Trace	..
Spinach from Bangalore—			
(1)	1515	12880	12
(2)	818	11190	13
(3)	969	10830	26

It has been shown by a number of American workers,[2–6] that the calcium of greens rich in oxalic acid is not available to the system due to the fact that calciumoxalate is the least available of all calcium salts.

The calcium, anhydrous oxalic acid and the amount of calcium solubilised by *in vitro* digestion with pepsin-HCl of the commonly used South-Indian greens are given in Table I.

It will be seen from the above table that most of the greens are associated with large quantities of oxalic acid and the amount of calcium solubilised by pepsin-HCl is generally low when the oxalic acid content is high and *vice-versa*.

In accordance with the observation of Mary Spiers,[8] the results obtained also show that the calcium of greens rich in oxalic acid is unavailable and that the oxalic acid renders some of the usually available calcium of skim milk also unavailable. Addition of 8 per cent. Co. 9 raw rice to such a diet prevents the skim milk calcium being rendered unavailable by the oxalic acid present in the green (Table II).

TABLE II

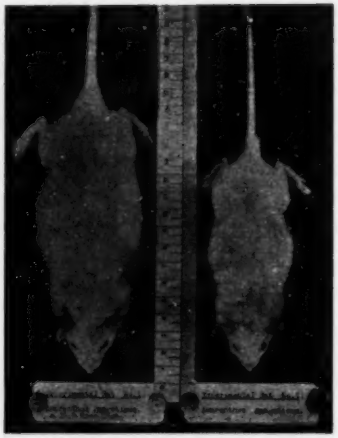
Diets	Number of rats	Average calcium availability %
(1) Skim milk (22 parts) (control)	4	62
(2) 11 Parts skim milk + a quantity of green (*Amaranthus gangeticus*) which contains the same quantity of Ca as is present in 11 parts of skim milk	4	35
(3) Diet (2) + 8% Co. 9 raw rice instead of starch ..	3	47

Sesbania grandiflora which contains very little oxalic acid (412 mg. per cent.) has a calcium availability (metabolic method) of 74 per cent. even at a very high level of calcium intake.

Preliminary experiments on the growth of rats with diets (suitable modification of Kon's[9]), *viz.*, (1) Co. 9 raw rice, (2) *Amaranthus gangeticus* and (3) *Amaranthus gangeticus* + Co. 9 raw rice, were carried out. In the course

of 7 weeks, 3 out of 6 rats on diet (1) died while the average weekly increase of a rat on diets (2) and (3) was 4 and 10 gm. respectively.

Quantitative experiments (Fincke and Sherman's[2] technique) with (1) *Amaranthus gangeticus* and (2) *Amaranthus gangeticus* + Co. 9 raw rice diets* were carried out. It was found that at the end of an experimental period of 32 days, 2 rats out of 3 on diet (1) died, the other rat had practically no retention of calcium while the rats on diet (2) had an average retention of 12 per cent. calcium even at a high level of calcium intake. The increase in the net body weight (whole rat *minus* gastro-intestinal contents) of the surviving rat on diet (1) was only 10 gm. while the average increase of the rats on diet (2) was 54 gm. The photograph shows the diifference of growths of the rats on the two diets.



The results clearly demonstrate that the oxalic acid present in *Amaranthus gangeticus* not only renders all its calcium unavailable but also decreases the availability of skim milk calcium. The inclusion of raw rice (Co. 9) in the *Amaranthus gangeticus* diet renders part of the skim milk calcium available. Further work to explain the above observation is in progress.

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V. V. S. Murty.

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February 13, 1940.

* Composition of diets

Ingredients	(1) *Amaranthus gangeticus*†	(2) *Amaranthus gangeticus* + Co. 9 raw rice
Egg white	15	15
Salt mixture[10](Ca.P. free)	3	3
Butter	5	5
Amaranthus gangeticus ..	15	15
Co. 9 raw rice	..	62
Corn flour	62	..
Calcium mgms.% ..	436	422
Phosphorus mgms.% ..	223	279

† 0·78 g. NaH_2PO_4 was added to 100 gm. of diet.

1 Rau and Ranganathan, *Zeit. f. physiol. Chem.*, 1939, **258**, 137.
2 Fincke and Sherman, *J. Biol. Chem.*, 1935, **110**, 421.
3 McClugage and Mendel, *Ibid.*, 1918, **35**, 353.
4 Sherman and Hawley, *Ibid.*, 1922, **53**, 375.
5 Fairbanks and Mitchell, *J. Nutrition*, 1938, **16**, 79.
6 Tisdall and Drake, *Ibid.*, 1938, **16**. 613.
7 Horwitt, Cowgill and Mendel, *Ibid.*, 1936, **12**, 237.
8 Mary Spiers, *Ibid.*, 1939, **17**, 557.
9 Kon, *Milk and Nutrition*, Part I, 1937, 12.
10 Avellar De doureiro, *Arch. petol. Lisboa*, 1931, **3**, 72.

On the Occurrence of the Foraminiferal Genus *Orbitocyclina* in the Cretaceous Rocks of the Trichinopoly District, S. India

Our knowledge of the Orbitoidal foraminifera from the Cretaceous rocks of the Trichinopoly District is confined to a single species, *Lepidorbitoides minor*,[1] described from a collection made by H. F. Blanford (1858) from near Niniyur and Chokanadapuram. In the course of

a recent examination of orbitoids collected from the Upper Cretaceous beds about two miles south of Chokanadapuram, I have noticed besides *Lepidorbitoides*, the occurrence of a form assignable to the genus *Orbitocyclina* (Figs. 1–3). This genus was created recently by Vaughan[2] for *Lepidorbitoides minima* H. Douville (= *Polylepidina cardenasensis* Galloway, 1928) and has been shown by him to be an intermediate form between the Cretaceous *Lepidorbitoides* and the Tertiary *Polylepidina*. The validity of the new genus *Orbitocyclina* has, however, been recently questioned[3, 4] and it has been suggested that it is only a synonym of *Lepidorbitoides*. Since the initial spiral of the equatorial chambers noticed in the new genus does not occur in *Lepidorbitoides* (*S.S.*), it would be necessary to distinguish the two forms by retaining the name *Orbitocyclina*, at least, as a

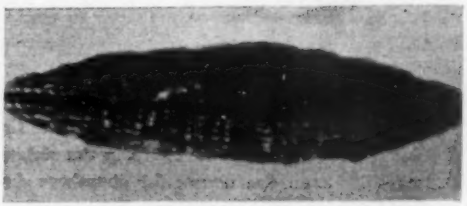

FIG. 3

Meridian section of *Orbitocyclina* sp. to show the absence of pillars. × 25. Loc.—same as above.

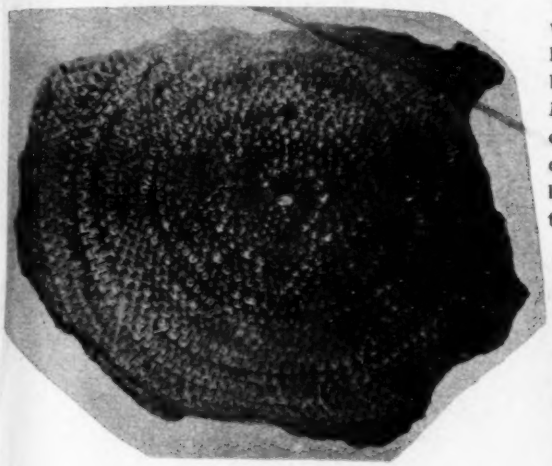

FIG. 1

Equatorial section of *Orbitocyclina* sp. (A-form). × 25. Loc.—2 miles south of Chokanadapuram.

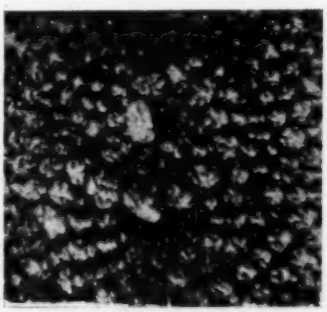

FIG. 2

Part of Fig. 1 enlarged to show the embryonic apparatus of the *Lepidorbitoides*-type followed by 12 peri-embryonic chambers arranged in a spiral. × 60.

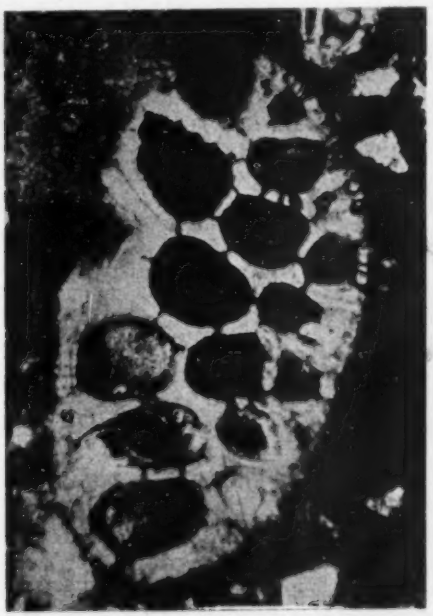

FIG. 4

Equatorial section of *Lepidorbitoides* sp. The stolon-passages and chambers appear dark due to the presence of infiltrated ferruginous material. × 90, Loc.—same as above.

sub-genus. According to Vaughan,[5] *Orbitocyclina* is so far known only from the Cretaceous beds of America, and the present find is interesting as extending its geographical range to South India also.

It may also be pointed out that all the Trichinopoly orbitoids exhibit clearly the stolon-passages between the equatorial chambers due to the infiltration of some ferruginous material (Fig. 4); and it is interesting to note that Stoliczka had observed these passages in the South Indian material as well as in specimens of *Lepidorbitoides* from the type area in Maëstricht (Holland), so far back as 1873.

A full account of the Orbitoidal foraminifera in my collection will be published elsewhere.

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March 10, 1940.

[1] Originally described as *O. Faujasi* by Stoliczka (*Pal. Ind.*, 1872–73, Ser. 8, **4**, 61–62), and later as *O. minor* by Vredenburg (*Rec. Geol. Surv. Ind.*, 1908, **36**, 205). Vredenburg's identification was, however, questioned by Douville (*Pal. Ind.*, n.s., 1916, **5**, mem. 3, 34) who included it in his synonym of *L. socialis*.

[2] Vaughan, T. W., *Proc. Nat. Akad. Sci.*, Washington, 1929, **15**, 291.

[3] Rutten, M. G., *Proc. K. Acad. Wetensch.*, Amsterdam, 1935, **38**, 186.

[4] Thiadens, A. A., *Jour. Pal.*, 1937, **11**, 99.

[5] Vaughan, T. W., *Proc. Nat. Acad. Sci.*, Washington, 1933, **19**, 925.

Asynapsis in Chilli (*Capsicum annuum* L.)

ASYNAPSIS is a meotic abnormality in individuals—both animals and plants—in which no chromosome pairing takes place at diakinesis and metaphase I. Plants showing this phenomenon have been described such as maize, wheat, oats, rice, *Datura*, *Nicotiana*, *Oenothera* and *Pisum*. Asynapsis in plants may be induced by external agencies like temperature, X-rays, chemicals, etc., or may be genotypically controlled. In some of the above-mentioned species the occurrence of asynaptic plants has been traced to the presence of recessive genes.

During the year 1938–39, in a population of chilli plants raised from seeds obtained from a seed-store, one plant was noticed to be highly sterile; it formed only a few ill-developed pods with only two or three seeds in each, in spite of profuse flowering. Its pollen was found to be nearly 90 per cent. sterile. A cytological examination of pollen meiosis of this plant was undertaken. At diakinesis (Fig. 1) 24 univalents were noticed in most cells unlike that in normal plants where 12 bivalents (Fig. 2) were invariably found. Occasionally, however, a bivalent could be seen in some cells, loosely paired at one end only. The metaphase congression was absent in the cells of the sterile plant and the anaphase (Fig. 3) set in with unequal and irregular distribution of univalents to the poles. The first division as a

6. Diploid

7. Trisomic

8. Trisomic

9. Triploid

consequence was very irregular. Some cells, however, showed restitution nuclei in them at this stage. The second division was more regular but many of the pollen grains degenerated soon after meioses.

The few seeds set on this plant by open pollination were sown during 1939–40 and ten plants were raised to maturity. Of these, two plants were found to be triploids, two trisomics, and six diploids. Pairing of chromosomes at meiosis was normal in the diploids which showed normal fruiting and setting of seeds. The triploid plants, one of which is shown in Fig. 9, were larger in size than the diploids (Fig. 6) and had about 80 per cent. sterile pollen. Fruiting was scarce although the plants continued to flower over a longer period than the diploids, and seed-setting was limited to a few in each pod. Pollen meiosis in the triploids showed varying numbers of trivalents, bivalents and univalents at diakinesis. Fig. 5 shows a diakinesis with $9^{III} + 3^{II} + 3^{I}$. The two trisomics each with $2n = 25$ chromosomes had 30–40 per cent. sterile pollen but formed a good number of fruits with seeds. They differed, however, in their habit; one trisomic (Fig. 7) had thick foliage, clustered flowers and produced fruits in clusters while the other (Fig. 8) was dwarfed, with spreading branches and flowers borne singly in the axils of leaves. It is believed that they are two different primary trisomics each containing a different chromosome of the haploid set as an extra in it. An attempt will be made to obtain the other ten primary

trisomics. In the trisomics, at division I, the extra chromosome was found to lie outside the metaphase plate, as a univalent (Fig. 4) or was found paired with its homologues forming a trivalent.

The progenies of all these plants will be studied during the next season and a fuller report of the work will be published elsewhere.

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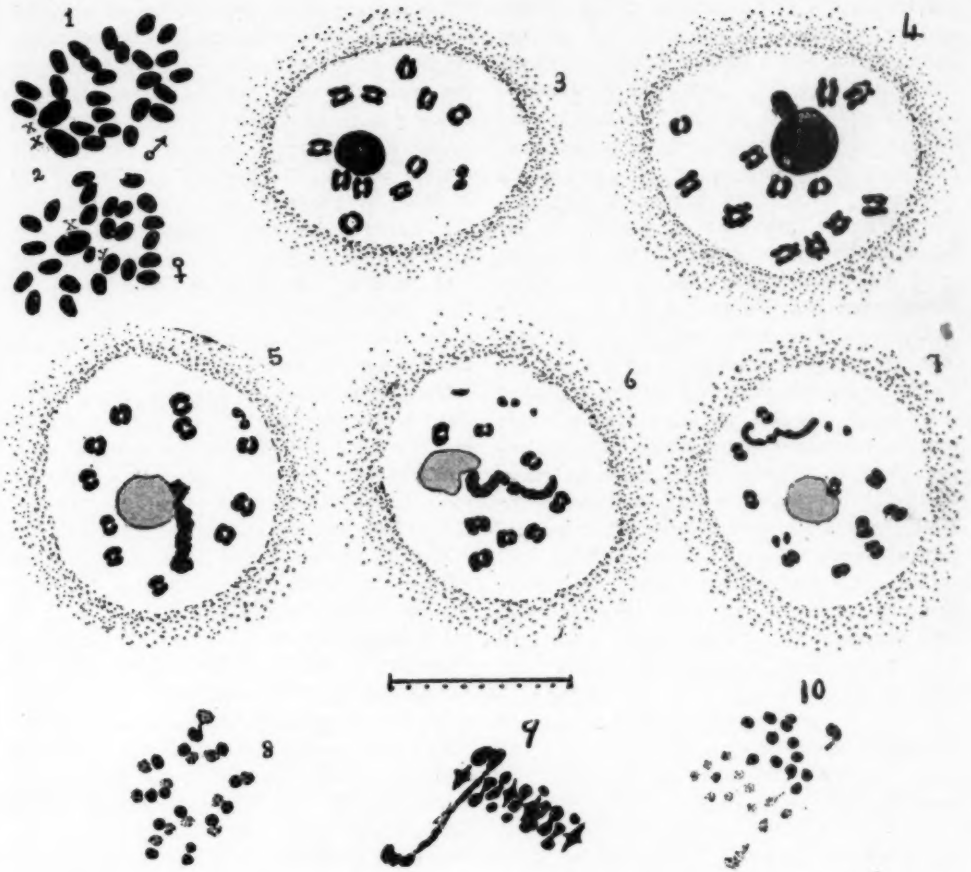
February 10, 1940.

Sex Chromosomes of *Coccinia indica* Wight and Arn.

Coccinia indica Wight and Arn. is a dicœcious species belonging to the Natural Order Cucurbitaceæ. Chromosome numbers of *C. hirtella* ($2n = 24$) and *C. indica* ($n = 12$) have been determined by McKay[1] and Sutaria[2] respectively. In a detailed study of the behaviour of chromosomes during mitosis and meiosis of normal and parthenogenetically developed male and female plants of *C. indica* the authors have observed that thirteen chromosomes in the gametic and twenty-six in the somatic tissues are most frequently met with. Of the twenty-six chromosomes in the female, twelve pairs were of uniform size and the thirteenth was heteromorphic in that one chromosome of the pair was bigger and the other smaller than any of the remaining chromosomes of the complement (Fig. 2). Similarly in the male, twelve pairs were of uniform size and equalled in size the corresponding pairs in the female. The thirteenth pair in the male was homomorphic and consisted of two large chromosomes, which were as large as the large chromosome in the heteromorphic pair of the female (Fig. 1). It was also observed that the largest and smallest chromosome in the female and the two largest ones in the male show somatic association during mitosis (Figs. 1 and 2). The heteromorphic pair (XY) of the female and homomorphic pair (XX) of the male constitute the sex chromosomes of *Coccinia indica*. This observation was further confirmed by the behaviour of the sex chromosomes during a study of meiosis in microsporogenous tissue.

The chief feature in the development of sex chromosomes during meiosis in *C. indica* is the delay in their origin. They do not appear until the autosomes have undergone considerable longitudinal contraction and have reached the late diplotene stage. Fig. 3 shows the twelve bivalents at diakinesis stage with the pair of sex chromosomes not yet formed. At about this stage from the persistent nucleolus an outgrowth arises which later extends out to form a coiled structure (Figs. 4 and 5). Still later this detaches itself to form the homomorphic pair of sex chromosomes each with a secondary terminal constriction (Fig. 6). From his study of the behaviour of nucleolus Mensinkai[3] concludes that there is an exchange of material between nucleolus and chromosome. Gates[4] in his review of the association of the nucleolus with Sat-chromosomes and chromosomes with secondary terminal constriction brings out the fact that these chromosomes are responsible for the organization of the nucleolus at telophase. The method of formation of sex chromosomes as observed in *C. indica* during prophase appears to show the reverse process of what happens at telophase in other cases. In telophase the chromosome organize the nucleolus and in prophase nucleolus organizes the chromosome from which it had previously arisen.

During microsporogenesis the sex chromosomes of *C. indica* are further characterized by their end association due to the presence of a single terminal chiasma in the shorter arn (Figs. 6 and 7). There is a differential condensation of the longer and the shorter arms and the longer arm shows negative heteropycnosis (Figs. 6 and 7). The non-pairing of the longer arm, differential staining, negative heteropycnosis and complete absence of chiasmata appear to indicate that the longer arm represents a genetically inert region. This inference is also strengthened by the observation of end association between the short arms only. At



metaphase the sex pair invariably orientates itself along the edge of the equatorial plate as in sex chromosomes of rat (Koller and Darlington[5]).

During anaphase the sex chromosome pair shows precocious separation (Figs. 9 and 10) due to the presence of a single terminal chiasma on it and the twelve autosomal pairs having two interstitial chiasmata each, separate subsequently (Figs. 3 and 9). Anaphasic separation of the sex chromosome pair shows a chromatid bridge between the genetically active short arms (Fig. 9). Precocious separation and bridge formation as observed in *C. indica* also appear to be a common feature of the sex chromosomes of the diœcious species in both dicotyledons and monocotyledons studied by Sinoto.[6] Occurrence of such a chromatid bridge in the sex chromosomes and their precocious separation, according to Darlington, is better explained due to genetic effect than due to inversion.

Association of sex chromosomes with nucleolus has been observed in insects and in Hepatacæ among the Cryptogam. In Figs. 4–6 the association of sex chromosomes with nucleoli is clearly evident. Such a type of association among higher flowering plants has so far not been reported and the present instance in *C. indica*, therefore, appears to be the first of its kind.

Heterogametic (XY) condition of the female, such as it exists in *C. indica*, is very rare in plants. It has so far been observed in *Fragaria elatior* by Lilienfeld.[7] In *C. indica* parthenogenetically developed plants in which the male element has been completely excluded have been observed to segregate into male and female individuals during three successive parthenogenetic generations, showing that it is the female which is heterogametic. This is corroborated by the heteromorphic (XY) pair of chromosomes observed during mitosis in cells of the root tip of the female plants. This inference of heterogametic condition of the female is further confirmed by the statistical analysis of the size variation of the pollen grains. Frequency distribution of the pollen-size variation gives a sharp unimodal curve indicating the homogametic condition of the male. In those cases where male is heterogametic such curve is bimodal (Greguss Pal[8]).

From cytological study, segregation of parthenogenetic progenies and pollen analysis, it is clearly evident that the female of *C. indica* is heterogametic and the male homogametic.

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G. B. DEODIKAR.

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Poona,
February 3, 1940.

[1] McKay, J. W., *Bot. Gaz.*, 1930, **89**, 416.
[2] Sutaria, R. N., *Jour. Univ. Bombay*, 1936, **4**, 21.
[3] Mensinkai, S. W., *Ann. of Bot., N.S.*, 1939, **3**, 763.
[4] Gates, R. R., *Nature*, 1939, **144**, 794.
[5] Koller, P. C., and Darlington, C. D., *J. Genet.*, 1934, **29**, 159.
[6] Yosito Sinoto, *Proc. Imp. Acad. Tokyo* (Japan), 1928, **4**, 175.
[7] Lilienfeld, J. A., *Japanese Jour. Bot.*, 1936, **8**, 119.
[8] Greguss Pal, *Mathematische Nature. Ang. Ungarie. chen Academy*, Budapest (Hungary), 1927, **44**, 378.

Macadamia ternifolia F. Muell., the Queensland Nut

THE writer published an account of floral anatomy and embryology in *Macadamia ternifolia* F. Muell. some two years ago[1] and subsequently some further observations about the floral vascular structure were made in the same plant. These necessitated the publication of a second paper as a supplementary contribution to the subject. After the final preparation of this for the press (the paper has now appeared in the January issue of *Current Science*, 1940),[2] the writer came across a paper by Hartung and Storey[3] on "The Development of the Fruit of *Macadamia ternifolia*" in a recent number of the *Journal of Agricultural Research*. Evidently, these authors have not had any access to the first paper by the writer on *Macadamia*,[1] for they make no reference to it which contains a description of many interesting features in the development of the ovule.

Hartung and Storey[3] describe the development of the integuments of the ovule and point out at great length that in the formation of a hard shell in the mature seed it is only the outer integument that takes part, thus contradicting the earlier opinion of Francis[4] who regarded the shell as a combined testa and tegmen. In this connection it must be noted that the present writer had already stated in his first paper on *Macadamia*[1] that the shell is "formed by the outer integument" and that "within this hard coat are the thin and crushed inner integument, a few surviving layers of the peripheral portions of the nucellus and the remnants of the endosperm". He had further remarked that "all these are pressed firmly together and fusing with"—better, clinging to—"the outer hard coat of the seed, form a smooth and shining internal lining for the outer integument." Hartung and Storey[3] further discuss the nature of the fruit and remark that during their study "considerable doubt arose as to the accuracy of the generally accepted classification of the fruit as a drupe and of the shell of the nut as an endocarp or putamen". They call attention to the statement by Francis[4] that "A considerable amount of confusion exists in the descriptions of the fruit in systematic, botanical literature" and state that "He advances evidence in support of the fact that the nut is truly a seed and the fruit in which it is contained is not a drupe but a follicle." It is thus clear that the term *nut* may only be retained for common usage and for the purposes

of trade, the true nature of the fruit having been long ago pointed out by Francis.[4]

There are several other features in *Macadamia ternifolia* which are met with in the developing seed following fertilization (*cf.* Kausik[1]) and the reader will have to look in vain for an allusion to any of these in the paper by Hartung and Storey.[3] The chalazal region of the ovule contains a meristematic region, which can be detected even in young stages, and on account of the activity of this region, especially after fertilization, several layers of additional cells constituting an extensive nutritive tissue arise at the base of the ovule. This tissue is next invaded by the lower end of the embryo-sac which forms a number of processes containing a few free endosperm nuclei. The cellular portion of the endosperm is restricted only to the upper half of the embryo-sac.

A chalazal meristematic region has been recorded in the literature of the Proteaceæ in a few other members also, as *Protea lepidocarpon* (Ballantine[5]), *Grevillea robusta* (Brough,[6] Kausik[7]), and more recently in *G. Banksii* (Kausik[8]). Further, the writer has pointed out the formation of a remarkably worm-like structure, discovered for the first time and designated the *Vermiform appendage* of the endosperm, which invades the chalazal nutritive tissue in the developing seed of *Grevillea robusta* and *G. Banksii*. A similar structure has also been seen in *G. hilliana* and it is probable that it is a constant feature in the genus *Grevillea*.

In so far as Hartung and Storey[3] have not referred to any of the above interesting features already described in *Macadamia ternifolia* and in the other investigated members of the Proteaceæ, it must be remarked that their paper, which otherwise forms a welcome addition to the meagre literature of the family, falls short of being complete, even though the contention of the authors be that their interest lay chiefly in discussing the nature of the fruit in the Queensland nut.

With regard to the floral vascular structure in *Macadamia ternifolia* the writer has to say that he has very recently published a detailed account of it (Kausik[2]) in which he has also fully discussed the nature of the perianth and that his observations agree with the rather too brief account given by Hartung and Storey.[3] One interesting point (not mentioned by Hartung and Storey) is that in the formation of the vascular supplies to the perianth segments the midrib strand shows a distinctly double origin at the time of separating from the receptacular stele. Finally, it may be mentioned here incidentally that the writer has also now completed a study of the vascular anatomy of the flower in *Grevillea robusta*, the results of which are set forth in a separate paper to be published elsewhere. In this paper it has been shown that the staminal trace arises in the form of a pair of strands towards the inside of the midrib strand of the perianth and that the two members of the pair are seen distinctly separated from each other not only at the base of the flower but also for some considerable distance higher up in the perianth, fusing only below the level at which the anthers are no longer adnate to the floral envelope. This feature has been discussed in the light of the origin of the stamen from a branch-system as proposed by Wilson.[9]

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University of Mysore,
Central College,
Bangalore,
February 6, 1940.

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1 Kausik, S. B., *Proc. Ind. Acad. Sci.*, 1938, **8**, 45.

2 —, *Curr. Sci.*, 1940, **9**, 22.

3 Hartung, M. E., and Storey, W. B., *J. Agric. Res.*, 1939, **59**, 39.

4 Francis, W. D., *Proc. Roy. Soc. Queensland*, 1928, **39**, 43.

5 Ballantine, A. J., *Ann. Bot.*, 1909, **23**, 161.

6 Brough, P., *Proc. Linn. Soc. N.S.W.*, 1933, **58**, 33.

7 Kausik, S. B., *Ann. Bot.*, N.S., 1938, **2**, 899.

8 —, *Ibid.*, 1939, **3**, 812.

9 Wilson, C. L., *Amer. J. Bot.*, 1937, **24**, 686.

Vegetative Sports in the Bamboo (*Bambusa arundinacea* Willd.)

VEGETATIVE sports in the sugarcane are well known. Striped sugarcanes occasionally show unicoloured ones which on vegetative propogation maintain this character and *vice-versa*.

There would appear to exist, however, no record of similar sporting in the bamboo. This photograph of a clump of *Bambusa arundinacea*, showing a striped sport might, therefore, be of some interest. The avenue which was originally planted from buds obtained from the nearby forests is over 27 years old, and about half a dozen, out of a total of fifty clumps, are showing this phenomenon. These sports show marked golden yellow or brown stripes on a

green background; the stripes vary in width and depth of colour as in the sugarcane.

Ever since the hybridization between *Saccharum officinarum* (P.O.J. 213) and *Bambusa arundinacea* Willd. was successfully effected in the year 1936, a closer study of the two plants has been revealing points of similarity betewen the two in spite of the great disparity in systematic position. This adds yet another character to the list.

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Imperial Sugarcane Station,
Coimbatore,
March 4, 1940.

On *Epipyrops* (sp. n.): A Parasite on the Nymphs and Adults of the Sugarcane Leaf-hopper (*Pyrilla* sp.)

THE caterpillar of this microlepidoptera was observed parasitising the nymphs and adults of sugarcane leaf-hopper at Muzaffarnagar in October 1934. The parasitic caterpillar is covered with a flocculent white material and is coccid-like in appearance. Its moth was identified as a new species by the Imperial Institute of Entomology, London (*vide* Collection No. 7252, List No. 1332, dated 21st November 1935). This insect has recently been named as *Epipyrops melanoleucea* by T. Brainbrigge Fletcher.

The adult moths are dark blue in colour and measure about 10 to 12 mm. across the wings with greyish brown appendages. Males and females do not vary much in size. The former can be distinguished from the latter by their prominent bushy antennæ and comparatively slender abdomen.

The population of these moths increases after the rainy season is over. From October to middle of December, males have been observed to come out in large numbers in the open spaces in the fields at about 9 O'clock in the morning. They briskly fly about in the sun till about 12 O'clock when they go back to the fields. It is after these flights that males are generally seen in association with female moths which are docile and do not move far from the cocoons after emergence.

The general colouration of the body is pink but it is masked all over with the white flocculent material except on the ventral side in the region of the appendages. The mature larva measures about 5 mm. The head is inconspi-

cuous in size and is turned at right angle to the body. The original contours of the head continue to exist though the mouth parts undergo a change on account of the parasitic habit and work as a sucking organ. Thirteen body segments are there but thorax and abdomen cannot be marked out separately. Every segment has its own covering of the white material. The thoracic appendages have atrophied and the pseudo-legs are sessile with crochets in the form of a circle.

The female moth is fertilised within a few hours after emergence and the eggs are generally laid not far from the cocoon. The eggs are deposited singly in clusters of irregular shape on the surface of the leaf within a few hours of fertilisation which is mostly over by the afternoon. Generally all the eggs numbering about several hundreds are deposited in one egg mass if the female is not disturbed during the process of oviposition.

An individual egg is oval in shape, microscopic in size and dark brown in colour. Incubation lasts for 4 to 5 days. The young larva possesses all the characters of a caterpillar. It is brown in colour with a prominent head, appendages and other body segments. It crawls about briskly in search of its prey for a day or two and attaches itself to some part of the body of the nymphs or wings of the adults. It dies if it fails to spot a host within two days of its active existence. After assuming the parasitic habit the mouth works as a sucking apparatus. Thoracic appendages atrophy. Pseudo-legs become sessile and cease to function. The larva gets mature within a fortnight of parasitic life. During this period the host nymphs or adults move about along with their growing load of parasitic caterpillars. *Pyrilla* nymphs and adults become sluggish and lose much of their agility with the growth of the parasite. Often the nymphs and adults die after they have been released by the parasites.

The mature parasitic caterpillar rolls about on the surface of the leaf leaving behind a white track. It is from the secretion of the white sticky material and alternate strokes of the head from one side to the other that a cocoon is formed. The formation of a cocoon takes about four hours. Pupa is creamy yellow when fresh but gradually becomes brown. It is dorso-ventrally flattened with several rows of spines present on the dorsal surface at the anterior boundary of fifth to eighth abdominal segments. The adult moth emerges after a week or ten days' pupation. On the approach of emergence the cocoon gives way on one side and pupa is dragged out to the opening where it splits for the exit of the moth. An individual life-cycle takes about a month during September and October, *viz.*, egg 4 to 5 days, caterpillar 15 to 20 days, and cocoon 7 to 10 days.

Proportion of male and female moths is more or less equal. The male moth is a quick flier than female. Both live for about a week in captivity. They were tried to live on honey solution in the laboratory but there was no prolongation of their life. The parasite is equally fond of *Pyrilla* nymph as adults.

The over-wintering cocoons issue forth the moths of first brood by the beginning of April when *Pyrilla* adults are quite common. A few cases of parasitisation can be observed in the field at this period. The moths of second brood come out by the first week of May but no sign of parasitisation has so far been observed in the field during the hot weather. With the advent of rain in July the parasitic cases can be seen again. The parasitisation is abundant from August to October and parasite-bearing nymphs and adults as well as cocoons on the leaves are a common sight. Their activity begins to slow down from the beginning of December when the parasitic caterpillars secrete cocoons to lie dormant in winter.

The percentage of its parasitisation increases with the increase of *Pyrilla*. This parasitic species of microlepidoptera remained of academic interest for long. Its economic importance was better understood in the *Pyrilla* epedemic of 1937–38 when they were observed to parasitise about 40% of the nymphs and adults. The one great benefit of this parasite is that adult females of *Pyrilla* become incapable of

oviposition after they have been parasitised by *Epipyrops*.

B. D. GUPTA.

Sugarcane Research Station,
Muzaffarnagar,
February, 2, 1940.

A Note on the Lady-bird Beetles (*Coccinellidae*) Predating upon the Cane White-Fly, *Aleurolobus barodensis* Mask.

THE cane white-fly, *Aleurolobus barodensis* Mask., is a serious pest in Banki which is an important sugarcane-growing tract in Orissa. The conditions which seem to favour the growth of the pest are:—

(i) The temperate-humid climate of the place, (ii) the practice of ratooning and (iii) the application of ammonium sulphate to the canes in order that they may quickly grow high up and escape the regular menace of floods. This practice, however, gives the crop a succulent leafy growth which finds favour with this pest, as with all other sucking insects.

The white-fly being thus abundant on the canes in that area it is not unusual to find its natural enemies like the parasitic hymenoptera and fungi and the coccinellid predators. While the former two categories of enemies have found, however meagre a place in the literature, one finds that practically no attention has been paid to the coccinellid predators. This appears to be due to the fact that the study of Indian *Coccinellidæ* on the whole has been neglected.

During my short stay in the Banki sugarcane tract of Orissa in July and August 1939, I observed the following nine species of coccinellids actively predating upon the various stages of the cane white-fly. For the majority of these coccinellids a record of their preying upon the cane white-fly is new.

1. *Cœlophora octo-signata* Muls.
2. *C. perroteti* Muls.
3. *C. unicolor* var. *romani* Muls.
4. *Cœlophora* sp.
5. *Chilomenes sexmaculata* (Fab.)
6. *Chilocorus nigritus* (Fab.)
7. *Verania discolor* (Fab.)
8. *Scymnus nubilus* Muls.
9. *S. gracilis* Mots.

Of these *C. octosignata*, *C. perroteti*, *C. sexmaculata* and *V. discolor* were breeding in the fields and their grubs were also actively preying upon the pest. *S. gracilis* preyed upon younger stages of the white-fly and also on the mites which were found in certain fields but not very commonly.

I wish to record my thanks to Dr. H. S. Pruthi, Imperial Entomologist, for identifying certain species of coccinellids mentioned in the text and also to Dr. V. K. Badami, Deputy Director of Agriculture, Orissa, for his many acts of kindness during my stay in that Province.

A. P. KAPUR.

Entomological Laboratory,
Srinagar, Kashmir,
February 2, 1940.

A Note on the Chemical Examination of *Celastrus paniculatus*

THE fixed oil from the seeds was examined by O. N. Kumaraswamy and B. L. Manjunath.[1] From the dark brown extract which they obtained with petroleum ether it appears that the 'rich orange coloured arillus' was rejected. They reported the presence of various saturated and unsaturated fatty acids and a sterol melting at 136°. In the course of this work they did not get 'satisfactory evidence for the presence of any alkaloid'.

Gunde and Hilditch[2] have also examined the oil from the husk and from the seeds. But from the dark brown colour that they have noted of the fruit coat extract, they appear to have investigated an old sample of the husk, as it has been noted by the present author that the bright red colour of the husk fades on being exposed to atmosphere. They have not investigated the unsaponifiable fraction besides noting the percentage yield.

The present author took up the examination of the bright orange coloured husk of the seeds

in an attempt to isolate any active principle contained in the drug, the presence of which is warranted by the medicinal properties attributed to the drug.

The bright red coloured petroleum ether extract of the husk on keeping in the frigidaire for a fortnight deposited a white crystalline mass which was found to be a mixture of free fatty acids. The mother liquors after being freed of the solvent were saponified. The unsaponifiable fraction thereby separated, yielded a sterol melting at 184° which gave the characteristic colour reactions of a phytosterol.

The saturated fatty acids fraction appears to contain, besides palmitic and stearic acids a higher melting fraction (90–94°) sparingly soluble in ether and soluble in hot methyl and ethyl alcohol. Working through this method the yields of the different fractions were:—

c.a., 10–15% of saturated free fatty acids.
c.a., 0·8–1·0% of a phytosterol (m.p. 184°).
c.a., 2% of a bright orange red colouring matter.
c.a., 70% saponifiable fatty matter.

The colouring matter contained in the mother liquors of the sterol has not so far been obtained in a crystalline form. It is fat-soluble, dissolves easily in the more common organic solvents and appears to undergo decomposition slowly in air and rapidly in presence of mineral acids. Chromatographic and other experiments for the separation and the purification of the colouring matter are in progress and the results of complete investigation will be published in due course.

Methyl alcoholic extracts of the petroleum ether exhausted drug are also being examined.

SHARIFUDDIN AHMAD WARSI.

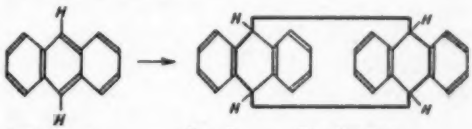
Imperial Agricultural Research Institute,
New Delhi,
February 21, 1940.

Polymerisation of Anthracene to Dianthracene from the Magnetic Standpoint

IN a recent paper,[1] Bhatnagar, Kapur and Gurbaksh Kaur have reported the results of a study of the polymerisation of anthracene to dianthracene by magnetic susceptibility measurements with a view to determine the constitutive correcting factor, λ, for the cyclobutane ring. Proceeding on the assumption that the polymerisation involves, among other structural changes of minor significance, (1) the loss of two double bonds and (2) the formation of a four-membered ring as a bridge between the two anthracene rings, and employing the relation

$$\chi_M = 2\chi_A + \lambda,$$

where χ_A and χ_M are the diamagnetic susceptibilities of anthracene and its dimer respectively, they have deduced the value for λ to be $+ 21{\cdot}6 \times 10^{-6}$, as compared with the value, $3{\cdot}05 \times 10^{-6}$, obtained by Farquharson and Sastri[2] from the magnetic susceptibility measurements of cyclo-butane carboxylic acid and of *n*-valeric acid. It must be pointed out that in the conversion of anthracene to dianthracene,[3] *no four-membered ring is formed*, but that the bridging group consists of an eight-membered puckered ring, as shown by the thick lines in Fig. 1.



Anthracene FIG. 1 Dianthracene

In this polymerisation reaction, two anthracene nuclei disappear and four benzene rings are present in the dimeric molecule formed. Since the constitutive factors for benzene and anthracene nuclei are $1{\cdot}5 \times 10^{-6}$ and $-16{\cdot}2 \times 10^{-6}$ respectively, and net change in the diamagnetic susceptibility to be expected would be $(+2 \times 16{\cdot}2 - 4 \times 1{\cdot}5) \times 10^{-6}$, i.e., a fall in diamagnetism by roughly 26×10^{-6} units, neglecting the influence of ring-formation. The observed fall in diamagnetism, *viz.*, $21{\cdot}6 \times 10^{-6}$, is of this order,

[1] *J.I.C.S.*, 1936, 353.
[2] *J.C.S.*, 1938, 1980.

and the difference, *viz.*, about -4×10^{-6}, is of the order to be expected for strain-free rings.

It, therefore, appears probable that the large fall in diamagnetic susceptibility observed in the conversion of anthracene to dianthracene is due principally to the replacement of two anthracene nuclei by systems of bridged benzene nuclei.

J. FARQUHARSON.

Chemistry Department,
University College, Rangoon,

M. V. C. SASTRI.

Department of Pure & Applied Chemistry,
Indian Institute of Science,
Bangalore,
January 31, 1940.

[1] Bhatnagar, Kapur and Gurubaksh Kaur, *Proc. Ind. Acad. Sci.*, (A), 1939, **10**, 486.

[2] Farquharson and Sastri, *Trans. Farad. Soc.*, 1937, **33**, 1474.

[3] Schonberg, *ibid.*, 1936, **32**, 514.

WHEN anthracene polymerises in light to form dianthracene no four-membered ring is formed as is quite clear from the diagram in our original paper on page 469.[1] What happens is that the two anthracene molecules in parallel plane are bridged together through four carbon atoms. Hence the word 'bridged four-membered ring' was coined. One can of course regard the contour of such a bridged structure as an eight-membered puckered ring. There is no doubt that if we calculate the susceptibility value of dianthracene in accordance with the puckered ring structure, *i.e.*, by taking into account the presence of four benzene rings and absence of bi-nuclear carbon atoms, the calculated value of λ does agree well with the observed one but in doing so we assume that the benzenoid character of the middle ring is lost, and consequently no correction for bi-nuclear carbon atoms is applied. There is, however, no support for such an assumption and consequently we coined the word 'bridged four-membered ring' and proceeded to show that its constitutive correction factor is entirely different from a cyclic four-membered ring. Unfortunately the choice of the expression has not been happy as it has caused confusion for example in the preceding letter.

Cyclo octa-diene is another eight-membered cyclic compound which is analogous to the bridged ring suggested in dianthracene. We were not able to trace its susceptibility value and were investigating compounds of this type to clarify the issue when the above letter was forwarded to us.

S. S. BHATNAGAR.
P. L. KAPUR.
GURUBAKSH KAUR (MISS).

University Chemical Laboratories,
Lahore,
February 14, 1940.

[1] *Proc. Ind. Acad. Sci.*, (A), 1939, **10**, 468.

The Molecular Weight of the Methyl Ether of Tetrahydro Rottlerone

McGOOKIN, Robertson and Tittensor[1] mention that "the results obtained in molecular weight determinations were consistently much higher than that demanded by the formula $C_{20}H_{18}O_4$ for rottlerone". But they give no data in support of this contention. We have recently determined the M.W. of the methyl ether of hydrogenated rottlerone, m.p. 101·5°, in benzene. 0·1915 gr. dissolved in 21·975 gr. of benzene gave a lowering of 0·12° whence M.W. is 372. Again 0·1570 gr. dissolved in 21·975 gr. of benzene gave a lowering of 0·099° whence M.W. is 369·5.

The methyl ether $C_{20}H_{20}O_2$ $(OCH_3)_2$ requires M.W. 354, whilst the English authors formulate rottlerone as $C_{41}H_{46}O_8$ and presumably the methyl ether is $C_{45}H_{54}O_8$ requiring M.W. 722. Therefore we are definitely of the opinion that no case has been made out for the doubling of the formula of rottlerone. Therefore, the question arises as to what is the nature of the product of interaction of formaldehyde and 5 ; 7 dihydroxy 8-β-phenyl propionyl 2 : 2 di-

methyl chroman described by the English authors. As it is identical with the hydrogenated rottlerone and a diphenyl methane type is precluded by the molecular weight determinations, the nature of the reaction is still obscure. Our experiments in this connection are not complete but we are convinced that rottlerone is not a diphenyl methane as pictured by the English authors—the probability is that it is a flavanone. We are elucidating this point and our results will be published shortly.

J. N. Ray.
K. S. Narang.
B. S. Roy.

University Chemical Laboratories,
Lahore,
March 20, 1940.

[1] *Journ. Chem. Soc.*, 1939, 1579.

A National Research Council for India

The proposal to inaugurate a National Research Council is one which should be examined very carefully from every point of view. Hitherto, most of the people who have given expression to their views on this subject have had before them the example of the Department of Scientific and Industrial Research in Great Britain. They have consequently pictured the proposed National Research Council somewhat on the lines of this Department. It should, however, be remembered that besides Great Britain other advanced countries also have Departments or Councils which control, finance, promote or co-ordinate scientific and industrial research. Since we are in the position of latecomers in this field and wish to establish a Council now, it is highly desirable that we should take advantage of the experience gained and the lessons learnt by others. I, therefore, think that we should in the first place appoint a small Committee to collect all available information on the subject of industrial research departments or councils from other countries including Great Britain and prepare a small pamphlet showing the constitution of such departments or councils, the principles governing their work and the means by which they attain their objectives in practice.

Whatever may be the future constitution of the proposed Research Council there are some general principles which will have to be considered in this respect. There is, for example, the question of the personnel. In my opinion, it is highly desirable that the majority of the members of such a Council should be scientists and technical experts. They alone can fully appreciate the significance and the relative importance of the scientific investigations, and though they will naturally enlist the help of the laymen so far as routine matters are concerned, the direct control and regulation of the affairs of the Council should be in their hands.

It is presumed that the Council, when constituted, will have funds of its own to devote to the promotion and encouragement of scientific research. In fact, without large funds at its disposal—if the Council is merely expected to work in an advisory capacity—it cannot fully discharge its functions in a satisfactory manner. If the Council is given necessary funds to cater for the scientific needs of the country, it will be very desirable to evolve some kind of machinery to ensure that these funds are utilised properly and to the best advantage. If those, who have the grant of funds in their power, are also expected to submit schemes for scientific and industrial researches, the tendency might develop for a man or a group of men to support another in the hope of a similar compliment. It would, therefore, be necessary to ensure that the examination of the merits of schemes of scientific research and the granting of funds for their prosecution are generally in the hands of completely disinterested and utterly impartial men who are also qualified to apply their minds to these subjects.

One of the main functions of such a Council would be the co-ordination of scientific work in the country. Of late, the term 'co-ordination' has been very frequently used without, I am afraid, a clear understanding of its implications in many cases. While co-ordination on a broad

scale is essential for the prevention of duplication of work and consequent wastage of time and labour, it must not be allowed to assume such a form as to permit undue interference with or strangulation of scientific work. In a country of the size of India, with its numerous complex problems awaiting to be solved, it is sometimes not only inevitable but necessary that more than one person should be engaged on more or less similar work. In such cases co-ordination must be interpreted in a liberal and not in a stringent sense, as otherwise it may have a tendency to place undue power in the hands of those who happen to be associated with the work of the Council.

NAZIR AHMAD.

Indian Central Cotton Committee,
Bombay,
February 27, 1940.

I ENTIRELY agree to the proposal for instituting a Central National Research Council which should explore and adopt means for organising and developing all the industrial researches in our country, and which at the same time should work in co-operation with and be *the co-ordinating agent* for all the existing industrial research departments in India. Needless to say, it is with the fullest of co-operation that the thing could work most successfully.

B. K. DAS.

Osmania University, Hyderabad (Dn.),
Zoology Department,
February 25, 1940.

THE country certainly needs a central co-ordinating agency for guiding industrial research, if there is to be no set-back to the hard-won industrial progress of the last two decades. This need is nowhere felt greater than in the mineral industries, where the raw produce of the mines, the ores and industrially vital minerals have been allowed to leave the country in ever-increasing tonnages simply because of lack of technical guidance in the processes of dressing, refining and manufacture of raw minerals for fitting them to the needs of commerce and industry. Whether the proposed research organisation functions independently or as a Government department or on lines analogous to the Mellon Institute of the U.S.A., it should not lose its character, mainly as a national advisory council for planning and directing industrial research.

D. N. WADIA.

Department of Mineralogy,
Torrington Square,
Colombo,
March 5, 1940.

IN response to the Editor's request for a short note on the above subject I would draw attention to the following aspects of the question:

(*a*) What has happened to the Reports and Recommendations of the Holland Industrial Commission which was so active during the Great War and from which so much was anticipated?

(*b*) Could not more be done to advertise the bulletins at present being published under Government authority? Thus the excellent *Bibliography of Industrial Publications*, Bulletin No. 1 of the Industrial Research Bureau, does not seem to be widely known. Local publishing agents do not apparently keep any serious stock of Government publications and consequently some time and trouble is necessary to procure them from Simla if they are even then available.

(*c*) Effort should be made to co-ordinate large-scale and cottage industries on the lines developed by Henry Ford in connection with his motor industry. With the extension of electrical power transmission to the villages this should not be too difficult of accomplishment.

(*d*) Before starting new industries those at present in operation should be, if possible, improved and perfected.

(*e*) It should be particularly realized that the driving power behind industrial development nearly always depends on the availability of men of outstanding force and special aptitude. Such men should be carefully sought for among the younger generation. It may be sadly recorded that India has suffered a great loss in this respect from the premature passing of J. A. D. Naoroji.

(*f*) Finally, the present Industrial Research Council with its co-ordinated practical expression in the Industrial Research Bureau may well serve as a nucleus for the larger body which is the subject of the present discussion.

GILBERT J. FOWLER.

Madras,
March 1, 1940.

THE proposed Council should consist of experts representing all phases of industrial manufacture in India, who should be well-informed of world progress in their respective branches and capable of advising on the value of projected developments. They would work under an unbiassed chairman of experienced organising ability.

The Council should be so expert as to be able to guide the exploitation of both the natural resources and the capital of India in the desired directions. It should determine the deficiency and surplus of commodities in the present and future needs of India, demonstrate methods and processes found of value in other countries and pursue new ideas so as to attract private and public capital and enterprise, and generally promote research into manufacture. It should set up bureaux of trade and scientific information and advice, an institution to standardize methods and materials, laboratories for industrial chemistry and physics and engineering, and send *liaison* officers abroad to inform on the disposal of India's exports. A free hand should be given to guide and rationalise industrial research already in progress. The immediate problem is economic—to find out major defects in India's self-sufficiency and to promote these industries.

W. L. DAVIES.

New Delhi,
March 5, 1940.

A NUMBER of industries have their problems solved in science institutions, by making extra provision in their original equipment. This would be economical to the industries which cannot maintain special laboratories of their own.

There should be provision in existing libraries for classified literature, edited in a suitable form, to help existing and new industrial concerns. Industries may be called upon to make contributions in this direction.

A complete register should be maintained of industrially useful scientific researchers with topics that they can handle so far as information and facilities are available. The actual problems of different industries should also be registered and arrangements made for their solution.

Accurate information regarding raw materials, processing, testing and marketing could be given through the establishment of standardizing and testing laboratories. These will be necessary to numerous smaller industrial concerns that cannot be expected to maintain special testing and expensive appliances.

G. R. PARANJPE.

Royal Institute of Science,
Bombay,
March 6, 1940.

IN proportion to the size and resources of India there are not yet adequate facilities for scientific research, especially in connection with industrial research. Attempts are being made to utilise the resources of the Indian Institute of Science to further this cause and one can but hope that these efforts will succeed. The Universities in India are doing more and more scientific work. It would be surely desirable to have a definite plan of scientific research and this can best be done by an all-India body like the National Research Council. In this venture it is necessary to gain the good-will of industrialists who should be prepared to take advantage of opportunities for scientific research. An army of scientists working in every industrial concern would tend to improve the quality of work, while it would harness the scientific genius and talent in our country.

A. R. WADIA.

Maharaja's College,
Mysore,
March 11, 1940.

REVIEWS

Annual Review of Biochemistry, Vol. VIII. By James Murray Luck and James H. C. Smith. (Annual Reviews Inc., Stanford University P.O., California), 1939. Pp. ix + 676. Price $5·00.

Progress in the field of Biochemistry during the last few years has been both rapid and spectacular; the intimate bearing of the subject on problems of human welfare, human physiology, pathology and nutrition, and the great fascination of a rich harvest offered by a virgin field, have been responsible for the wealth of material which has accumulated. During this eventful period of scientific achievement, the *Annual Review of Biochemistry* has played useful and praiseworthy part in marshelling together the widely scattered facts and tailoring them into a presentable, cogent and thought-provoking picture. It is difficult to assess the value of these reviews in terms of the "brain waves" which they generate in the mind of the experienced investigator as he reads them. It is in this direction of provoking thought and promoting fresh endeavour, that the value of such reviews lie, and it is in this manner that the *Annual Review* has been serving and will continue to serve the cause of the advancement of biochemistry.

The eighth volume of the *Annual Review* records an all-round and substantial progress in biochemistry. In the field of biological oxidations and reductions, the year has witnessed the discovery of a new coenzymic nucleotide by Warburg, a new catalytic flavo-protein from milk by Green and the "diaphorase" by Euler which supplies the missing link in the respiratory mechanism of animal tissues and accounts for the reaction of the reduced coenzyme with oxygen. Professor Tiselius' contribution on the chemistry of proteins and amino-acids, is specially devoted to a discussion of certain physico-chemical properties of proteins, relating to size, shape and stability as revealed by ultra-centrifugal investigations. Proteoclastic enzymes are reviewed by Professor Linderstrom-Lang while Professor Myrbäck deals with the non-proteolytic group, which contains a critical summary of his contributions to the nature of the reaction products of the enzymatic degradation of starch. Choline as a dietary factor, is discussed by Professor Best and his collaborator. King's contribution on the water-soluble vitamins is exhaustive and critical. It includes all the available information regarding the physiological function of the components of the vitamin B group and of the other water-soluble vitamins.

The review includes two refreshingly unfamiliar and exciting contributions, animal poisons by Kellaway and ruminant nutrition by Marston. There are other reviews, brain and nerve, lipid, protein and mineral metabolism, etc., equally important and interesting.

With the birth of the new companion series, *Annual Review of Physiology*, the strain on this *Review* will be considerably eased and the volumes of this series will discuss aspects of a more chemical character. This tendency is already reflected in the present volume.

The *Annual Review* is an indispensable part of the scientific equipment of every investigator who wishes to keep abreast of the progress of biochemistry. The service which the *Review* has rendered to the scientific community during the last eight years of its career entitles it to our deep gratitude.

M. S.

Ergebnisse der Enzymforschung. Band VIII. Edited by F. F. Nord and R. Weidenhagen. (Akademische-Verlagsgesellschaft, M.B.H., Leipzig), 1939. Pp. x + 324. Price R.M. 28.

Eleven contributions including two from India, comprise the eighth volume of this well-known and internationally recognised series. They cover a wide variety of subjects, viruses, nitrogen fixation, pH optima of digestive enzymes in vertebrates, enzymes of wood rotting fungi, the genetics and biochemistry of flower colour variation, etc.

The article on the preparation, purification and properties of the virus protein, also contains a review of the author's ultra-centrifugal studies on the size and shape of virus particles. Wilson's contribution on the mechanism of nitrogen fixation, clarifies the position of this difficult and intriguing problem and presents a critical discussion of

the various hypotheses relating to the question of the intermediate product of fixation advanced by different workers.

Of special interest is the article on the importance of enzymes in clinical diagnosis, by Ammon and Chytrek, which gives striking instances in which tissues and tissue fluids in their pathological state, suffer a pronounced and measurable alteration in their enzymatic make-up. Immuno-chemists will find the contribution on the enzymatic analysis of the antigenic structure of pneumococci extremely stimulating. In this article one will find a considerable amount of new and extremely useful technique, helpful in cytochemical investigations.

Other articles of fundamental interest include a review of the low molecular weight "überträger"s or coenzymes and their function in biological oxido-reduction systems, and a resume of our knowledge regarding aldehyde mutase by Dixon. Professor Nord, the enterprising editor of the series, has contributed an article on the enzymatic decompositions brought about by fusaria, which incorporates a substantial portion of his own work in this field. Attention should be invited to the excellent article on the respiration of animal tissues by Martius, which discusses, in a clear manner, the catalytic rôle of the dicarboxylic acids, first investigated by Szent Györgyi.

The volume has fulfilled the high expectations to which we are accustomed. This international enterprise will suffer a regretful set-back as a result of the War in Europe and we shall not have the privilege of reviewing the ninth volume of the series for some time. Let us hope for the speedy dawn of peace and for the early appearance of the ninth volume, which will be enthusiastically welcomed by seekers of biochemical knowledge, the world over. M. S.

Handbook of Chemistry. By Norbert Adolph Lange. Third edition. (Handbook Publishers Inc., Ohio), 1939. Pp. 1543 + 249 + 34. Price $6·00.

The third edition of this handbook which has recently made its appearance, has fully maintained its established reputation as the largest and best book of its kind yet published.

The present edition is an improvement over the previous ones in several ways: Six new tables, not found in the second edition, have been offered for the first time; these are: (1) Physical and mechanical properties of cast metals, (2) Reduction of barometer readings to sea-level, (3) Symbols of thermo- and physico-chemical quantities, (4) Dimensional formulas, (5) Properties of various photographic film emulsions, and (6) Comparative photographic emulsion speed ratings. A number of tables representing some 167 pages, have undergone thorough revision in order to bring the information up to date. Another decisive improvement is the successful attempt made to render the book "self-defining"; this has been achieved by the inclusion of a new section giving the definitions of all column headings and technical terms used in the handbook, tables of the commonly accepted thermo- and physico-chemical symbols and a table of dimensional formulas.

The reviewer has been using *Lange's Handbook* during a period of over five years and it has never failed him. There is hardly any information required by a chemist or chemical engineer which is not presented in this book in a clear and unambiguous manner. All pertinent information widely scattered in chemical or physical literature has been classified and presented and within its covers are arranged tables of interest to workers in mineralogy, X-rays, physiological chemistry, electro-chemistry, foods, drugs, bacteriology, medicine, physics, metallurgy, etc. The printing is clear and the get-up excellent; the handbook fully maintains its reputation as the most comprehensive work of its kind.

Mathematics Applied to Electrical Engineering. By A. G. Warren. (Chapman & Hall, Ltd., London), 1939. Pp. 400, Figs. 132. Price 15*sh*.

This book forms volume nine of "A Series of Monographs on Electrical Engineering", edited by Mr. H. P. Young. The book is divided into 22 chapters followed by three useful appendices, a bibliography and an index.

No branch of Engineering requires such a high standard and variety of mathematics as Electrical Engineering does. A book, such as the one under review, containing "all the mathematics required by Electrical Engineers", followed by worked examples illustrating the applications, has been a long-felt want. True, there have been many books published under somewhat similar title but a perusal of such books always

gave the impression that the stress was more on the mathematical results rather than on the engineering significance. 'The outlook of the Mathematician differs from that of the Engineer.' Mr. Warren deserves to be congratulated for, though he deals in the book "high order mathematics", he writes it essentially with the outlook of an Engineer. It is felt that in this book most of the mathematical needs of all classes of Electrical Engineers have not only been fully recognized but satisfied.

The book is not meant for the undergraduate, though one appearing for the degree may read it with profit, in the first 16 chapters. It is meant for the advanced student and Engineer. It presupposes a groundwork in mathematics during the fundamental degree course in any university, as the treatment of 'Calculus' is but brief and pertains to immediate applications to Electrical Engineering.

A special feature of the book is the large number of worked examples, illustrating the applications. Any one can read often Chapter V, which contains a very concise and yet useful resumé of the fundamental Electrostatic, Magnetic and Electromagnetic relations.

In general, the treatment of differential equations (Chapters X to XVI and XIX) deserves special notice. Such advanced subjects like the Bessel, Beta, Gamma functions, Fourier Series and Harmonic Analysis, Heaviside's operational calculus, conjugate functions—(not usually taught for the fundamental degree)—are covered in a lucid manner in the later chapters (XVII, XVIII and XX to XXII). These chapters are, however, specially commended to Communication Engineers. But these may be omitted, unless one needs them.

The style throughout is straightforward and clear, though on occasions one wished the author had been a little more elaborate and explanatory, but then this criticism could, perhaps, be dismissed on the ground that the book was not meant to be an Elementary Text-Book, but a monograph for the advanced student, Engineer and Research Worker.

While the problems in Communication Engineering have been dealt with in considerable detail, it is felt that similar attention has not been devoted to portions in Power Engineering. For example, that vast subject of recent origin—'Symmetrical Components'—has just been touched in but a few pages towards the end of Chapter VII. It certainly deserves a more generous treatment—especially its applications to short-circuit calculations; and, the treatment of 'Vectors' in Chapter VII appears a bit too meagre. Perhaps, the object of the 'Bibliography' at the end of the book is that any reader interested more deeply in any one subject should choose a specialised treatise recommended therein.

It is considered that the utility of the book would be enhanced by including the following: Determinants, Matrices, Methods of formulating equations or laws from experimental results or curves, methods of preparing nomograms. The author may include them in a revised edition.

The book is warmly recommended to all Electrical Engineers—power or communications—who have any flair for mathematics. The author deserves all credit for producing such a book, wherein he has given some thirty years' experience of Engineering education and research. The general get-up of the volume is excellent and the price reasonable.

V. V. L. R.

A Text-Book of Geomorphology. By Philip G. Worcester. (Chapman & Hall, Ltd., London), 1939. Pp. 565. Price 22/6d.

Geomorphology, the scientific study of land-forms and interpretative description of the relief features of the earth, is the science that has emerged from the reaction of geology on geography. The cultural value of such a study to the ordinary man in his outdoor life is being recognised on all hands now. The intelligent interpretation of his physical environment, and the seeking of the meaning of the mountains, rivers, lakes, plains and plateaus which he views around him daily can be the means of an enduring pleasure to the modern man of education and culture.

The present book is a handsome volume of 565 pages, containing 375 illustrations and photographs, many of them of great scenic value and beauty. The text is written in a manner which does not presuppose or demand any geological knowledge from the reader. By simple explanation of geological terms and expressions and by the elimination of technical language the author has succeeded in driving home, the general principles on which nature has worked in imprinting on the earth's face its existing

physiognomy. While the majority of the examples and illustrations are drawn from America, a few are chosen from other parts of the world. Excellent as the illustrations from nature are, a few diagrammatic and block figures and sections would have helped the explanations of the text to a considerable extent. The subject of Earth Movements and Structure of the Earth has received rather inadequate attention—barely 28 pages; these important agencies in the dynamics of the earth which have played a large part in shaping the "last chapter of earth history", *viz.*, its present geography, could well have been treated a little more expansively.

The book will be found useful and interesting by the general reader besides the students of geography and geology.

D. N. WADIA.

Propagation of Horticultural Plants. By Guy W. Adrianace and Fred R. Brison. (McGraw-Hill Publishing Company, Ltd., Aldwych House, London, W.C. 2), 1939. Pp. 314. Price 20*sh.*

The basic principles of all the practices followed in the propagation of plants are set out clearly. Though the book does not deal with the subject in such minute and exhaustive detail as one would wish, it serves its purpose as a guide for practical work. Latest researches on the subject such as the utility of plant harmones and synthetic growth substances used to stimulate root formation and plant growth have been touched upon. The suggested references at the end of each chapter would be useful to those who would seek further enlightenment.

The first three chapters easily prepare the student to scientifically understand and follow the several practices mentioned in the later parts of the book. Chapter IV deals with the important subject of germination of seeds and seed treatments to control disease. Chapter V mentions the several types of forcing structures such as cold frames, hotbeds, green houses and solar propagating frames and explains their uses and management. Chapter VII deals with the raising of several classes of "Bulbous plants". Chapter VIII deals with the multiplication of plants by layering; Chapter IX with multiplication by root, stem and leaf cuttings. The science of grafting, its objects, applications and limits are dealt with in Chapter X. The succeeding two chapters give an idea of the implements and accessories necessary for grafting operations and how these are carried on. Of the several methods suggested, the "approach" method is, however, the only one suited for our hot country. Methods and principles of budding are found dealt with in Chapter XIII. Chapter XIV is a large one giving an account of particular practices followed in producing healthy and disease-resisting plants for planting out extensively in orchards. Though almost all the kinds treated are subtropical plants such as peach, plum, apricot, cherry, almond, apple, pear, pecan, walnut, persimmon, etc., the notes on grape vine, citrus plants, avocado and the rose offer very useful information to us. The last two chapters deal with the essentials of transplanting operations and the growing and handling of nursery stock.

Like other McGraw publications, this book is bound to take its place as a standard treatise on Plant Propagation. It is invaluable to amateur gardeners, professional nurserymen, farmers and orchardists alike, as there are very few text-books on the subject dealing in such a masterly way. It is profusely illustrated and the printing and get-up leave nothing to be desired.

K. S. GOPALASWAMIENGAR.

Where Theosophy and Science Meet.—A Stimulus to Modern Thought—A Collective work. Edited by D. D. Kanga, I.E.S. (Retd.). Part IV—*Some Practical Applications.* (Vasanta Press, Adyar, Madras.) Pp. lxix + 223. Price Rs. 2–4–0.

"Most gratefully dedicated to HELENA PETROVNA BLAVATSKY as a loving and humble tribute on the occasion of the semi-centenary of the publication of the *Secret Doctrine*, 1888–1938", the fourth part of the work entitled "Where Theosophy and Science Meet" deals with "Some Practical Applications" quite in conformity with the law that theoretical principles and doctrines should be translated into practical applications. The volume or part under notice opens with a contribution by C. Jinarajadasa who writes on "Methods of Research". He holds that the method pursued by modern science, the Inductive method grounded on laboratory analysis, formation of hypothesis and verification will have to be ready to create a new technique. He writes *con amore* on Bergson's "Intuition" in the development of which the

next advance would consist. He concludes "When science some day will state that an unit of life goes with each particle as does the electric charge, *science will have become Theosophy*" (italics mine). Dr. D. H. Prins follows up with his contribution on "Psychical Research" in which he believes that Science and Theosophy can meet. M. Beddow Bayly writes on "Medicine". Part I of the article is a brief historical survey of the Western Theory and Practice of Medicine. An attempt is made in Part II to show that "much of the knowledge and skill claimed as the achievement of modern science can be traced in part at least in the medical systems of ancient India, Egypt, Greece and even China" (p. 40). Adeltha H. Peterson draws attention to the "baffling mystery of the variations in terrestrial magnetism". What is the theosophical solution of the mystery? The Earth is to be considered a "living being". Just as man has *chakras* (force-centres), the Earth has similar force-centres. Secondly, Theosophy speaks of a Plan of the World administered by an Inner Government (p. 74). The writer is convinced "that these Messengers of Inner Government knew of the mystery of magnetic variation" (p. 81). Charles E. Luntz explains the value and significance of "Astrology" which will surely be recognized by science. A. Rangaswamy Iyer writing on "Law", explains the evolution of the concept in reference to Root-races and sub-races. Peter Freeman elucidates how Theosophy is to be applied in practice to Politics and Government. How is World-Peace to be secured? How is Brotherhood of Man to be established? The author sketches a scheme of Declaration of Brotherhood and Human Rights. What would be the future Government? Democracy would be maintained doubtless, but, it will be co-ordinated with accepted aristocracy. The Best men for Government would be chosen on Dr. Besant's Scheme of Graded Franchise. The Theosophical Ideal of "Education" is expounded by Julia K. Sommer. The Self is to be educated, and Education should be directed to hastening the advent of the new human type. "And what of Art?" asks Claude Bragdon, and answers that the "prime requisite of great art is a rich spiritual life" (p. 194). "The union of intuition and reason, the fusion of Theosophy and Science, and the marriage of East and West is the consummation devoutly to be wished." "Whither Science?" interrogates Iwan A. Hawliczek. What were the changes in the past? How did they prepare the way for science in its present form? In what direction scientific research is likely to proceed in the future? These questions are answered by the author with an unmistakable theosophical orientation. In future, science "facts will take second place and potencies will occupy the position of major importance" (p. 206).

From the summaries of the contributions (necessarily brief on account of Editorial warning due to enhanced printing charges) sketched above, it must be obvious that the different writers have consistently repeated the conclusion in some form or another that modern scientific conclusions had been anticipated by theosophical teachers. Be that as it may, general reflections are recorded in the "Introduction" by D. D. Kanga, Editor of the series of monographs, to which attention should be directed. The "occult method" does not mark any departure from the "scientific method", but, it is merely an extension of it. When for whatever reasons or satisfaction of whatever exigencies, one and the same method is extended to certain hitherto unobserved facts or phenomena, it does not seem intelligible at all why there should be such startling differences and divergences in results. D. D. Kanga emphatically asserts that the scientific method or scientific training and discipline as he would put it, would appear to fail to change the heart of man. The scientific training and discipline "may make him an intellectual giant *but not a good man, clean in life, and pure at heart* ...." (p. xxxvi). The claim is made that the occult method is bound to succeed where the scientific method fails. D. D. Kanga throws out in fact an uncompromising challenge which I am sure scientists would take up and adequately answer. The charge that scientific training and discipline do not contribute to building up of pure heart and clean life is seriously damaging, and, I am able to detect a serious confusion of thought which alone should be held responsible for the adumbration or the promulgation of the charge. That certain celebrated achievements of modern science have been unscrupulously made use of in widespread destruction of fellowmen in wars is one thing, and scientific methodology aiming at discoveries, totally another. There is nothing inherently incompatible in the constitution of human nature of a scientist and a clean

life and a pure heart. An intellectual giant may well be morally most perfect and spotless. It is rather the other side of the shield which must attract those who may not have surrendered independent reflection and critical judgment. One must refuse to admit on *a priori* grounds that those who claim to pursue the occult method and enjoy its benefits are the paragons of moral and spiritual perfection. If the occult method is merely an extension of the scientific method, and if the pursuit of the scientific method fails to bring about moral and spiritual transformation of personality, how can the extension of the method *qua* extension enjoy immunity from the ills incidental to or concomitant with the very scientific method simply because the extension happens to be christened "occult"? I may state I have very carefully studied the monographs and nowhere is any demonstration or verification forthcoming to the effect that the extension of the scientific method, when it develops into the "occult", acquires altogether new properties, new potencies, and new efficacies. I have no quarrel as such either with the occult or with the scientific method. The occult method has its own sins of omission and commission even as the scientific. The kettle can never be permitted with impunity to malign the pot on the comic chromatic issue!! The four parts together have to be admitted to be a remarkable achievement. From Nature to Man, from Man to God, progress is sketched with care and caution, circumspection and constructive suggestions. One may or may not agree with the conclusions arrived at. The general series—where Theosophy and Science meet—is a magnificent co-operative concern on which the Editor and contributors have to be sincerely congratulated. While thus congratulating, I must emphatically protest against Jinarajadasa making Kapila the author of *Sankhya-Karika* (p. 10). No. The real author of the work was Iswara-Krishna. Sooner or later, it must be realized that both the occult and the scientific methods would yield but partial pictures of Reality. Both are partial. Both are truncated. Both are distorted. Both are heavily camouflaged. Both should be transcended in favour of a third. Only then can there be any talk at all of any meeting between "Science and Theosophy".

R. NAGARAJA SARMA.

Nomenclator Zoologicus, Vol. I. Edited by S. A. Neave. (Chapman & Hall, Ltd., London), 1939. Pp. xiv + 958. Price 17*sh.* 6*d.*

An enterprise of a pioneer nature has been started under the auspices of the *Zoological Society of London*. It is a four-volume work embodying the names of genera and subgenera of all the animals known and described till the end of 1935, of which the first volume has been published. Edited by Dr. Sheffield Airey Neave, of the *Imperial Institute of Entomology*, the work is the result of the combined labours of many famous zoologists of Great Britain, who have all contributed in making the work as authoritative as possible.

On completion the work is expected to contain more than 225,000 entries, of which, barring supplementary references and alternative spellings a total of about 192,000 entries represents the names of the known genera and subgenera of animals.

The first of the four volumes contains entries A–C and the other three are expected shortly. It is impossible to overestimate the usefulness of this work as a valuable reference book to zoologists and there is hardly any doubt that it will be a distinct addition to every zoological library in the world.

A. S. R.

Chemical Spectroscopy. By Wallace R. Brode. (Chapman & Hall, Ltd., London), 1939. Pp. 494. Price 36/-.

The spectrograph is now recognised as a useful adjunct to chemical analysis in all laboratories, and in some it is indeed a necessity. This modern industrial tool was at one time but a scientific device, the manipulation of which was associated with specialised experience in fundamental researches on spectra of elements and molecules. The contributions made, principally during the last decade, by Gerlach, Meggers, Twyman, Lundegardh, and others to the application of spectroscopic technique in chemical analysis, have gone a long way towards establishing the practice of this method. In the field of estimating minor constituents and impurities, particularly of a metallic character, the spectrograph possesses overwhelming advantages both in the speed and accuracy with which routine analysis can be carried out. Sensitiveness of one part in a million and speeds of 30 to

50 analyses a day, have been reached with modern technique. However, it would appear that except for some biological assays, no general official recognition has yet been given to this method of analysis. This may be due to the pitfalls that are still associated with quantitative emission spectra analysis and indicates the need for more work towards the standardisation of methods.

The book under notice purports to supply spectroscopic information to chemical workers and to serve also as a text-book for a course in chemical spectroscopy. As quite a third of the space in the book is covered by tables of principal and persistent lines of elements, and thirty-five charts of the iron spectrum with indicated line positions of other elements, it also forms a valuable reference text. A useful bibliography is provided. A feature of the book is the twelve laboratory experiments with full directions, comprising Chapter XII. Chapters XIII and XIV deal with theory and practice of photography, and the equipment and arrangement of a spectrographic laboratory, respectively.

Some of the chapters of the book intending to supply spectroscopic information such as those on resonance and chemical structure, and infra-red and Raman spectra, are wanting in their method of presentation and suffer from a too brief treatment. This latter is apparently due to the attempt to cover all aspects of spectroscopy within the compass of this book which is essentially of the nature of a *vade mecum*.

M. A. G. RAU.

Mr. Tompkins in Wonderland. By G. Gamow. (The Cambridge University Press, London), 1939. Pp. 91. Price 7*sh.* 6*d.*

The last two decades constitute a most exciting period in the history of scientific thought. Epoch-making discoveries, and startling adventures along new paths, have enriched this period as never before. But, the more profound of these concepts have been rather reserved for the delectation of the trained mathematicians. Einstein's Relativity Theory, Planck's Quantum of Action, Heisenberg's Matrix Mechanics and Principle of Uncertainty, Dirac's Symbolic Developments in Operational Mechanics, and L. de Broglie and Schroedinger's Wave Mechanics, are some of these blazing aspects of modern physics. However the ordinary man (and woman) including the 'lesser' non-mathematical scientists, are anxious to have some concept, at least some elementary ideas, about them. Although it is true that the frigid beauty of these developments must remain beyond their reach unless they take pains to gain an entry into the ranks of mathematicians and mathematical physicists, efforts have not been wanting on the part of the latter, to expound these new ideas in non-mathematical terms.

The book under notice is definitely one of the outstanding attempts in this direction. Prof. Gamow is an eminent Theoretical Physicist and is well known in academic physicist circles. But this book will at once make him popular among a much wider circle of grateful readers. The presentation, developed in the style of Lewis Caroll's "Alice in Wonderland", has been also given the alternative title of "Stories of c, G and h". Mr. Tompkins, a hard worked bank clerk, attends for the sake of diversion, a course of three profound University Extension Lectures, feels dazed by the high lights of science, and falls into a series of six dreams. In these dreams, he is wafted into new worlds with different values for physical constants which limit the applicability of the classical physical laws and demand rather novel changes in his usual and fundamental concepts of space, time and motion. At one time, he is much amused by his adventures in a relativistic city, as when a nice old lady addresses a gentleman obviously in his forties, as 'Dear Grandfather'. Another time, he gets into a "quantum jungle" where a large pack of tigers attack the elephant, jumping simultaneously from all sides. Well, as the film world will say, the reader must look for the rest in this inimitably written book. The publishers rightly point out in the wrapper that "Modern physics has come to stay, and this is its visiting card". The book is beautifully illustrated by John Hookam, and its cost is quite reasonable.

M. A. G. RAU.

CONTEMPORARY PHYSICS

Introduction to Contemporary Physics. By Karl K. Darrow. (Macmillan & Co., London), 1939. Second edition. Pp. 648. Price 25*sh.*

CONTEMPORARY PHYSICS is in large measure the physics of the atom. It was developed with great rapidity, and one cannot help but admire the valiant authors who from time to time have endeavoured to portray this kaleidoscopic scene, and mark out a path for the student to walk in. The decade of the twenties saw the first editions of many well-known books, which, though inevitably out of date almost as soon as they were printed, provided many of us with our first introduction to this fascinating field.

We have now reached the stage where the ephemeral books have disappeared altogether, and the better ones are passing into second and third editions. The volume under review is a case in point. The first edition was published in 1927, and the present volume, dated 1939, is the second. To compare the two is to see at a glance the astonishing progress that has been made in the intervening twelve years. The number of pages has grown from 453 to 648, but this hardly indicates the fundamental character of the changes. The new edition is not merely the old, with an addendum of 200 pages, but is essentially a new book. Facts known in 1927 are still facts, but as understanding of them has grown, so the interpretation placed upon them has changed. Accordingly Dr. Darrow has revised, and in large measure re-written, the whole text.

It may be said at once that the book in this edition retains those excellent features which made it so useful to students a dozen years ago. Dr. Darrow has an enviable gift of clear and succinct expression, in spite of an occasional fault of syntax and the introduction of neologisms such as 'uniformize'. But the latter are rare, and as a whole the book is extremely readable. The chapter 'Introduction to Wave-Mechanics', for example, is an instance of lucid exposition which can be read by the intelligent beginner with sustained interest.

A substantial part of the subject-matter, roughly the contents of the first half of the book, was in the old edition. Comparing for example the present chapter on the Analysis of Spectra with the corresponding one in the former edition, we find that whereas the paragraphs may for many pages follow the same order, in much the same language, there is evidence in a host of minor alterations of a painstaking and detailed revision.

The essentially new matter starts with wave-mechanics, and carries the reader on through the whole development of nuclear physics. Stress is laid more on the experimental facts and their general interpretation, and there is little or no attempt to dip into the theory of the nucleus. This method is doubtless right for a book of this type; the theories are in a state of flux, and possibly the third edition will provide an opportunity to discuss them. The experimental work is well selected and described, and the reader gets a very clear picture of the present position regarding such matters as nuclear transmutation and nuclear spins. The most striking omission is cosmic radiation, which obtains only incidental mention in connection with the positive electron. The omission is possibly deliberate, in view of the size of the book, but it is to be regretted, for cosmic radiation now looms very large in our picture of contemporary physics.

Readers of the old edition will regret the disappearance of the concluding chapter on the conduction of electricity through gases, which was a very useful summary of that subject, but many of its topics are mentioned at appropriate points in the new edition.

To those who used this book in its earlier form no commendation is necessary. To new readers it may be unreservedly recommended as an extremely interesting and reliable account of almost the whole field of atomic physics. It should in particular be read by honours students who desire not merely a compendium of facts, but a book which will bring them a wider and deeper understanding of the methods and the ideas which underlie the remarkable developments of contemporary physics. H. J. T.

CENTENARIES

Lahire, Philippe De (1640–1719)

PHILIPPE DE LAHIRE, a French mathematician, was born at Paris, March 18, 1640. His father was an artist and following his footsteps Lahire first practised painting and sculpture. When he visited Venice in 1660 partly for health and partly for improving his professional knowledge, he changed over to mathematics, particularly to the geometry of the conics.

A Prolific Writer

On return to his native country, he became professor of mathematics in the Royal College of France. He wrote about nine books, mostly on geometry. The first book was entitled *Theorie de coniques* (1672). The last was published in 1702 and it was an astronomical table. Besides these he contributed over 50 articles to learned periodicals. He did not use the calculus in any of his investigations.

Geodetic Work

In 1679 he was commissioned by the King to survey the coast of Gascony along with Picard to obtain data for a general map of France. In 1683, he was engaged in the measurement of the meredian. He was also employed in determining the difference in level of the river Eure and the reservoir of Versailles, preparatory to the construction of an aqueduct for water supply.

Lahire died at Paris, April 21, 1719.

Olbers, Henrich Wilhelm Mathias (1758–1840)

HENRICH WILHELM MATHIAS OLBERS, a German doctor by profession, who is now remembered for his astronomical discoveries, was born at Arbergen near Bremen, October 11, 1758. He studied medicine in Gottingen. Throughout his long life his time was divided between the practice of his profession and the pursuit of his astronomical hobby.

His Private Observatory

He maintained a private observatory, believed to have been the best of those that then existed in Germany. It was equipped with two five-feet telescopes, an astronomical clock, a quadrant and a sextant; but it did not have a transit instrument or a mural circle. Attached to it was an astronomical library which was rich in cometography. This library was later purchased by the Emperor of Russia for the Observatory of Pulkowa.

Comets First

Olbers came to be known to astronomers by his observations of the comet of 1779. He made improvements in the method of calculating the elements of a comet's orbit. An account of his method was published at Weimer in 1797 and later incorporated in Delambre's *Astronomie*. Olbers calculated the orbit of all the comets that appeared later in his time down to the great comet of 1811. In 1826 he investigated the probability for a collision of the earth with comets.

Discoverer of Asteroids

An empirical law of planetary distances put forward by Titus, a contemporary of Keplar, was restated by Bode in 1772; and this led to a strong conviction that a planet should exist between Mars and Jupiter and the formation of a society of twenty-four astronomers to devote itself to the search. But though the credit of first sighting one of them (1801) went to Piazzi of the Palermo Observatory, who was outside this Society, he soon lost track of it. It was Olbers who accurately calculated its orbit and caught it again in 1802. A few months later he discovered a second asteroid and a still another six years later. The discovery of so many tiny asteroids in closely adjacent orbits led Olbers to suggest the idea that they were fragments of an exploded planet.

The Olbersia

The photographic method has now led to the discovery of nearly 2,000 asteroids. Olbers' name has been immortalised by the use of the term Olbersia to designate the asteroid numbered 1,002. Olbers was elected a Fellow of the Royal Society in 1804 and besides being made a member of several other learned bodies he was knighted by the King of Prussia; and his fellow-citizens at Bremen placed his bust in the public library of the city.

Olbers died at Bremen, March 2, 1840.

Maclure, William (1763–1840)

WILLIAM MACLURE, a pioneer geologist of America, was born in Ayr, Scotland, October 27, 1763. He had his early education from a tutor but he was always disposed to reject the learning of the schools for the simpler and more attractive truths of natural history. His vocation was commerce, while his hobby was natural history. In his travels he used to collect specimens and books of natural history for deposit in the United States which became his adopted country in 1803.

First Geological Map

As soon as he settled down in America, he commenced a most important scientific enterprise on which he had long contemplated as the ambition of his life, *viz.*, a geological survey of the United States. The greater part of the country was then a wilderness; nevertheless, he went forth alone and at his own expense and collected enough data for a paper to be printed in 1809 in the *Transactions* of the American Philosophical Society. This paper was in explanation of a geological map of the United States he constructed, the first map of

its scope in the history of geology. He went out again in search of data which rendered a second edition necessary as early as 1817.

Taken to be Lunatic

In after-life he often recollected with pleasure his experiences in this pioneer survey and beheld with unmixed pleasure the progress of geology in America, state after state arranging geological survey on a permanent official basis. When travelling in some remote districts, the illiterate inhabitants seeing Maclure, engaged in breaking the rocks with his hammer, supposed him to be a lunatic who had escaped from confinement; and on one occasion, as he drew near a public house, the inmates, being informed of his approach, took refuge indoors, and closing the entrance held a parley from the windows, until they were at length convinced that the stranger could be safely admitted. In this work he had to stand much privation and fatigue and his power of endurance he used to attribute chiefly to the undeviating simplicity of his diet "the regimen of which demanded nothing but water and a very small quantity of the most common food".

Identification with Science

This amateur geologist gave himself up entirely to science and education as he advanced in years. He became a foundation member of the Academy of Natural Sciences of Philadelphia (1812) and was its president from December 1817 to the end of his life. He personally supervised the publication of its *Journal*, provided it with a building at a cost of 20,000 dollars from his own private funds and transferred to it his private library and museum. His urge to encourage adult education was profound. He founded the New Harmony Working Men's Institute in 1838 and by his will provided for the payment of 500 dollars to any club of labourers which should establish a library of 100 volumes.

His End

Maclure spent the last years of his life in Mexico in the hope of aiding in the educational uplift of its people. In addition to the two geological maps, he published twelve papers, all on geology. His contributions on political, social and economic topics were collected and published (1837) in two volumes as *Opinions on various subjects, dedicated to the industrious producers.*

On his way from Mexico to the United States, on the serious failure of his health in 1839, he died at the village of San Angel, near the City of Mexico, March 23, 1840.

S. R. Ranganathan.

SEISMOLOGICAL NOTES FOR FEBRUARY 1940

During the month of February 1940 ten slight and one moderate shock were recorded by the Colaba seismographs as against four slight and one moderate shocks recorded during the same month in 1939. Details for February 1940 are given in the following table:—

Date	Intensity of the shock	Time of origin I. S. T.	Epicentral distance from Bombay	Co-ordinates of the epicentre (tentative)	Depth of focus (miles)	Remarks
1940		H. M. S.	(miles)			
Feb. 7	Moderate	22 36 4	5640	55°N., 178°E. (Bering Sea)	normal	
,, 8	Slight	20 45 15	1210	Hindukush mountains	125?	
,, 13	Slight	8 55 54	1270	..	..	
	Slight	17 16 25	1395	..	..	Felt severely n Shillong
	Slight	18 56 31	1230	..	..	
,, 16	Slight	6 36 46	1400	..	..	
,, 20	Slight	7 48 04	6900	In the region of New Hebrides Islands in the Pacific.	110-125	
,, 20	Slight	18 24 42	3950	..	..	
,, 22	Slight	19 0 57	3130	..	..	
,, 24	Slight	17 30 11	4890	..	..	
,, 29	Slight	21 37 46	3090	..	..	

The Colaba Observatory,
Bombay,
March 6, 1940.

ASTRONOMICAL NOTES

Eclipse of the Sun.—An annular eclipse of the Sun will occur on April 17, but no phase of the phenomenon will be visible in India. The path of the annular eclipse begins in the middle of the Pacific Ocean and passing through Mexico and the extreme southern part of the United States, ends in the Atlantic Ocean.

Planets during April 1940.—Mercury will be visible as a morning star throughout the month; on April 12 it will be at its greatest western elongation (27° 40′). Venus will continue to be a conspicuously bright object in the western sky during the early part of the night. It reaches greatest elongation east of the Sun (45° 44′) on April 17, its stellar magnitude at the time being $-4{\cdot}0$. Mars also will be visible high up in the western sky soon after sunset, but is gradually becoming fainter. It will be just to the north of the first magnitude star Aldebaran, and as the two are of nearly equal brightness and of the same colour, the objects will present a noteworthy appearance.

Both the planets Jupiter and Saturn will be too near the Sun for observation during the month; the former will be in conjunction with the Sun on April 11 and the latter on April 24.

A New Star in Monocerotis.—Information has been received of the discovery of a nova in the constellation Monocerotis by Prof. Wachmann of Hamburg on December 17, 1939 (I.A.U. Circular No. 806). The star was of the eighth magnitude at the time and the spectrum is reported to contain numerous emission lines. The position of the nova for 1939·0 is given by R.A. $6^h\ 40^m{\cdot}5$ and Declination 1° 56′ (south).

T. P. B.

MAGNETIC NOTES FOR FEBRUARY 1940

THE magnetic activity during the month of February 1940 was much less than that in the previous month. There were 9 *quiet* days, 19 days of *slight* disturbance and one of *moderate* disturbance during February 1940 as against 8, 16 and 2 days respectively in February of last year. There were no days of great or very great disturbance during the month while 2 days of great disturbance occurred during the same period of last year.

The day of greatest magnetic activity was the 25th and that of least disturbance the 18th. The characters of individual days are shown in the table below:

Dates of the month	Quiet	Disturbed	
		Slight	Moderate
February 1940	5, 7–9, 15, 16, 18, 22, 27	1–4, 6, 10, 11–14, 17, 19–21, 23, 24, 26, 28, 29	25

There were no magnetic storms during the month of February 1940, while three storms (two of great intensity and one of moderate intensity) were recorded during the corresponding period of 1939. The mean character figure for the month is 0·72 as against 0·89 for February of last year.

M. R. RANGASWAMI.

The Observatory,
Bombay,
March 6, 1940.

BOARD OF SCIENTIFIC AND INDUSTRIAL RESEARCH

WE wish to tender our hearty felicitations to the Government of India on their speedy decision to set up the Board from 1st April 1940. They have secured the co-operation of a number of prominent scientists and industrialists in the country to serve as its members. The Board is to be a consultative and advisory body; its functions will be to advise the Government as to the lines on which industrial research should be conducted and the channels into which it should be guided in order to ensure the co-ordinated develcpment of India's industries, particularly those the importance and possibilities of which, have been prominently brought into the foreground as a result of war conditions. The Board will utilise and coordinate the work of the existing organisations already employed in this field. The Board will also recommend to the Government what specific problems should be assigned for investigation to the staff directly under the Board on the one hand and to the various scientific and research institutions in the country including universities' laboratories on the other.

The first Board will consist of the following gentlemen who have accepted membership of the Board:—Dr. J. C. Ghosh, Dr. Nazir Ahmad, Dr. Meghnad Saha, Dr. S. S. Bhatnagar, Sir H. P. Mody, Sir Syed Sultan Ahmad, Mr. Kasturbhai Lalbhai, Lala Shri Ram, Mr. P. F. G. Warren and Dr. N. N. Law.

The Commerce Member of the Government of India will be the Chairman of the Board, and the Chief Controller of Stores, India Stores Department, will be its first Vice-Chairman. The Government have been able to secure the services of Dr. Bhatnagar, Head of the Punjab University Chemical Laboratories, as Director of Scientific and Industrial Research.

INDIAN BOTANICAL SOCIETY

Some More Items of Work for the Third Decade*

RAI BAHADUR PROFESSOR K. C. MEHTA, M.Sc., PH.D. (CANTAB.), F.N.I., in his Presidential Address to the *Indian Botanical Society*, drew attention to some new activities which the Society might take up in view of its members fully representing all the important branches of *pure* as well as *applied* Botany. He suggested the organization of the following regional branches, so that thrcugh the activities of each of the local branches, the Society as a whole might serve a still more useful purpose than it has done in the past:—

(1) Bengal, Assam, Bihar and Orissa should form one branch incorporating the present Botanical Society of Bengal; (2) The United Provinces, Punjab Province, Kashmir and Sind should form another branch; and (3) Bombay, Central Provinces, Hyderabad and Madras should combine for the third branch.

He said that there was an obvious advantage in forming such regional branches because in a country of the size of India more frequent meetings of the Society as a whole would be impracticable as has been the case in the past, and each regional branch should be able to meet at least twice a year during local holidays for reading papers of general interest, holding symposia, etc. These regional meetings would be of course in addition to the Annual Meeting of the Society. Dr. Mehta further suggested the formation of a Standing Committee for each of the main branches of Botany, Pure as well as Applied, such as (1) Morphology and Anatomy; (2) Palæobotany; (3) Cryptogams, excluding fungi; (4) Mycology and Plant Pathology; (5) Physiology; (6) Ecology; (7) Genetics and Cytology; (8) Agricultural Botany; and (9) a Curriculum Committee. The functions of these Committees amongst other things, he added, would be to scrutinize papers intended for publication in the *Journal*, write up periodic reviews of recent work done in other countries in their respective branches, suggest problems for investigation by advanced students in the various Universities and put them in touch with the foremost workers in that line, in and outside India, write up reviews for the *Journal* of the Society on works of general interest and arrange for symposia at the time of the Annual Meeting of the Society. In suggesting the formation of a Curriculum Committee, Professor Mehta expressed that he felt strongly that the scope of botanical teaching in the country as a whole needed revision, and this Society, in view of its representative nature, was the most competent body to deal with the matter.

Another item of useful activity which Dr. Mehta suggested was the publication of Botanical Memoirs written up by members of the Society possessing special knowledge of different branches of the subject. He proposed the publication of a standard text-book at least for B.Sc. students written up conjointly by members of the Society possessing special knowledge of different branches and the most practical way of making a beginning in that direction, according to him, was to allot, without delay, the preparation of memoirs to each of the proposed Standing Committees and get them published under the auspices of the Society. He suggested that such memoirs should later on be published in the form of text-books on behalf of the Society when the requirements of revised syllabuses for the different examinations were completed.

Professor Mehta further suggested that the Society should also find ways and means for maintaining two laboratories in the hills, one in the North and the other in the South so as to afford facilities to advanced students and research scholars for an intensive study of vegetation in the hills. For this purpose, he said, it would be necessary to approach the different Universities and perhaps the Provincial Governments also for grants-in-aid. In his opinion this was a pressing need of the Society and it was time that a strong committee were appointed for the purpose. Another useful service which the Society can render, he continued, would be to supply information through periodic bulletins regarding rare and interesting plants, collected by its members. He advocated the establishment of a clearing house to which all members be requested to supply a fairly large quantity, if available, of rare and interesting specimens that they might come across, for distribution to others.

Professor Mehta also proposed that four prizes, named after four foundation members, i.e., the late Dr. P. Bruhl, the late Rao Bahadur K. Rangachariar, the late Rai Bahadur Prof. S. R. Kashyap, and the late Dr. W. Dudgeon, be offered every year to writers of best essays on selected topics, preferably on subjects that each of the foundation members was specially interested in, for encouraging advanced students in writing up dissertations. For the benefit of advanced students, Dr. Mehta further proposed that it would be very desirable to publish small handbooks comprising the subject-matter of 3-6 lectures written up by the members of the Society dealing with their researches in the domain of Botany.

Y. BHARADWAJA.

* Summary of the Presidential Address by Rai Bahadur Professor K. C. Mehta at the Annual Meeting of the Indian Botanical Society, Madras, January 1940.

PROGRESS OF AGRICULTURAL RESEARCH IN INDIA

THE Ninth Annual Report of the Imperial Council of Agricultural Research covering the period 1st April 1938 to 31st March 1939, as usual, gives a brief account of the progress of the numerous research and other schemes carried out under the auspices of the Council. In the personnel of its officers the Council loses the services of Sir Bryce Burt, its experienced and energetic Vice-Chairman, who as the doyen of the Agricultural Service in India was an exceptionally valuable asset to the Council during the years he was connected with it. Sir Bryce Burt retired at the end of the year and at the beginning of the year his retirement was preceded by that of Col. Sir Arthur Olver who as the Council's Expert in Animal Husbandry, was able to initiate and organise the many-sided research in that important branch of agriculture to which the report bears ample testimony. In regard to research schemes practically every important crop is covered with, of course, the exception of cotton and jute which are served by separate organisations and funds; likewise animal husbandry has been embracing a gradually widening range of subjects. Nevertheless there is the feeling that the tempo in this respect has slackened somewhat and that many important schemes though considered and sanctioned have to remain on the waiting list for a very long time. Several schemes were completed in the year and some which should have come to a close have been extended for further periods. The current schemes number one hundred with a budgeted expenditure of Rs. 1,04,25,080 while those which came to a close and were not extended had a budget of Rs. 22,09,860.

Research on rice occupies an important place among the schemes and the results obtained already in the different centres are said to be of much practical value under the different local conditions. Thus the Assam schemes have led to the production of deep water rices suited to three different levels, the seeds of which were released for general distribution. Age of seedling experiments in Bengal, improved strains suited to local conditions in S. Bihar and the Central Provinces, a method of breaking dormancy in rice seed in Orissa, the use of molasses as a manure for rice in the United Provinces, fertiliser trials in all the centres may be of mention from among the year's results of this kind while on the scientific side work related to the composition of leachings from rice soils, physiological studies, water requirements, factors in the flowering of rices and so on. Fertiliser trials reveal considerable difference as between one province and another; in Bihar an application of 60 lbs. of N and 60 lbs. of P_2O_5 gave a net profit of Rs. 35 to Rs. 40 per acre; in the Central Provinces the highest net profit per acre was with 20 lbs. of P_2O_5 and amounted to only Rs. 3–12–0 per acre, while in Orissa doses of nitrogen from 20 to 40 lbs. gave increased yields which however did not pay for the cost of manure. In regard to wheat, certain methods for the control of rust have been advocated as the result of the investigations so far and these control measures are said to be under consideration for practical action. In barley several types have been sent from time to time to assess their suitability to the British market but no sample has been satisfactory in all respects; work on cholam malts was concluded in the year and methods of storing were worked out and its usefulness for infants and invalid children demonstrated. Fruit research schemes bulk largely and nearly every province and every kind of fruit is served. Among the results achieved may be singled out those relating to the cold storage schemes of Poona and of the Punjab which have been testing the suitability of different kinds of fruits and vegetables for cold storage; we look forward to useful results. While many lines of work have been taken on hand we feel that fruit pests and diseases are not receiving adequate attention; the chief and by far the most serious trouble with the fruit industry and one against which the grower feels helpless is disease and we think this should have the first claim as regards research for the devising of simple remedies. Among fibre crops sunn hemp is being studied; and the retting trials lead to some valuable practical conclusions which we hope will be tested by the actual cultivator and assessed for factory use.

Progress in research on oilseeds, including the diseases of the cocoanut trees in Travancore, on tobacco and potatoes has been slow. An officer was deputed in the year to the U.S.A. for studying the cultivation and preparation for market of tobacco, for a period of six months; two more such officers are also proposed to be sent; we think six months is too short a period for this purpose and also that the study should include the market in the U.K. in relation to supplies of Indian-grown cigarette tobacco. Soil research has related to fundamental problems; the new nitrogen fixation theories of Dhar on which much work was done are now pronounced not to be supported by experimental evidence. Much of the work in this section including that on the composition of town refuse is, we are glad to note, to be written up for publication. The dry farming researches seem generally to have yielded useful results, but in this, as well as in many other investigations, we feel that full use has not been made of work in the different departments especially of the earlier years. Sugar research continues to be the most comprehensive and enjoys the biggest budget. We are told that hereafter this work will receive a fixed proportion of the sugar excise duty realisations, amounting roughly to Rs. 11·2 lakhs per year. Very important investigations are in progress under this head; we would suggest separate short reports being issued on each of these both as interim and as final ones. The Institute of Sugar Technology admitted 19 students in the year for the various courses and 38 students completed their courses. In regard to the starting of the cultivation of cloves, action has been left to be

taken by the departments concerned, but we feel that unless some special attention is bestowed by the Council itself no satisfactory progress will be made.

The third meeting of the Animal Husbandry Wing of the Board of Agriculture was held in the year and a large variety of subjects was considered and schemes reviewed. The importance of mixed farming as an aid to fodder production was stressed and the grant of special funds from the Council to the provinces for this work was recommended. Cattle diseases like pleuro-pneumonia of goats, Johnes disease in dairy cattle, surra in horses, theileriasis of cattle, rinderpest of cattle, in goats and sheep, and Doyles disease of poultry were considered and further work on nearly all of them recommended. As a preliminary to pedigree registration the breed characteristics of seven important breeds were defined and the information was published in the year. In respect of sheep and wool, an animal nutrition scheme for Assam, investigation of poultry diseases, development of the fishing industry and apiculture and pig keeping, considerable preparatory work by the Council in the year is reported. We note that the proposal to open a Central Veterinary College for India has now been dropped. The Report contains a review of the operations of the Agricultural Marketing Officers and the Central Marketing Staff.

In addition to the three journals being published by the Council quite a large number of monographs, reports and bulletins were issued during the year. A description of crop plant characters in respect of rice and cotton, the voluminous reports on the cost of production of sugarcane and cotton, and a report on the prospects of cinchona cultivation in India may be mentioned among the large number of publications in the year. Among other activities may be mentioned an enquiry into the agricultural and veterinary needs of Coorg with a view to developing the resources of this small but important tract. The Report bears ample evidence that the Council is performing a most important function somewhat on the lines of the Federal Department of Agriculture in the U.S.A. Though fundamental problems and those of all-India application alone may be deemed to come within the sphere of the Council's activities, we cannot help thinking that the extent to which the work leads to practical results and to general adoption should be watched and suitably provided for. A. K. Y.

THE DEVELOPMENT OF GALACTIC DYNAMICS AND SOME ALLIED PROBLEMS*

THE Address deals with the dynamics of rotating configurations, and its astronomical applications. It also deals with the theories regarding the origin of the solar system.

The earliest work on the Maclaurin spheroids and pear-shaped configurations of liquid masses is first mentioned. This leads on naturally to the work of Jeans on rotating compressible masses. Of a fundamentally different nature is the work of Milne, Chandrasekhar and others on the distortion of polytropic configurations of a rotating mass in relative equilibrium. The Address deals exhaustively with the work of Chandrasekhar, Von Zeipel and Kopal in this field. Recent work, stimulated by the author of the Address himself, has generalised the results to the case where the variation of angular velocity, in specifying the polytropic configurations of a rotating gaseous model, is taken into consideration.

One of the most important applications of the theory of rotating gaseous configurations is to the explanation of the spiral arms of spiral nebulæ. Of several such theories the oldest is that of Jeans, but this theory meets with a number of objections. Later theories are due to Brown, Vogt and Lambrecht, Wellman, Jehle and the most comprehensive work is that of Lindblad. Recent investigations by Banerji, Nizamuddin and Bhatnagar appear to give reasonable conditions for the formation of spiral arms.

The last part of the Address is devoted to modern theories of the origin of the solar system. After a brief mention of the planetesimal theory of Chamberlain and Moulton, and the tidal theory of Jeans as modified by Jeffreys, the Address deals comprehensively with the binary star theory suggested by Russell. The theory of Lyttleton and objections to it by Luyten and Hill, and further modifications by Lyttleton are explained in detail. A recent suggestion of Banerji of looking at the problem as a problem of three bodies in its general aspects has enabled Bhatnagar to come to the conclusion that the result of collision would be that the components of the original binary would themselves collide. This provides another objection to Lyttleton's theory of a nature different from that pointed out by Luyten.

B. S. M.

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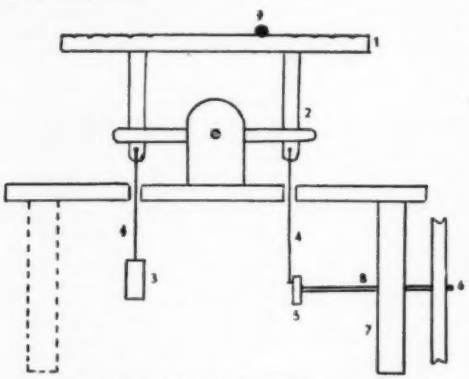
* Summary of Presidential Address.—By Prof. A. C. Banerji—Mathematics Section, Indian Science Congress, Madras, 1940.

SCIENCE NOTES AND NEWS

A Mechanical Model of the Cyclotron.—Mr. F. A. B. Ward has recently described (*Proc. Phys. Soc.*, September 1939) a mechanical model illustrating the principle of the Cyclotron. One such model was made for the Madras Presidency College Centenary Physics Exhibition. Ward's model will show appreciable acceleration of the steel ball only when the disc is made of metal and friction is very small as the ball is accelerated only when it travels the ramp—a distance of one inch—and the acceleration so produced at each step is small.

The model made at the Presidency College has a wooden disc. The cutting and polishing of the grooves are hence comparatively simpler. The disc is not cut into three parts as in Ward's model but is screwed as a whole to the oscillating arms (Fig.). The tilting mechanism has been modified and the model is much simpler in design and easier to make. The speed of the motor driving the larger pulley is adjusted to give resonance.



A mechanical model of the cyclotron. Scale 1 : 4

1. Wooden disc with spiral groove. 2. Oscillating arms. 3. Restoring weight. 4. Strings. 5. Wooden pulley with a nail fixed ½ cm from centre. 6. Large pulley connected to a slow motor. 7. Central third leg. (The model has only 3 legs). 8. Shaft running through the leg. 9. Steel ball representing the ion.

This model is, however, a less exact analogue of the Cyclotron than Ward's model as the steel ball is accelerated throughout one dee instead of between the dees. But the acceleration is greater and spectacular. The model illustrates the two main principles of the Cyclotron. (1) The suitably timed reversal of potentials (here reversal of levels) and consequent addition of velocities. (2) That time of travel of an ion is independent of the length of path.

T. R. JAYARAMAN.

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Weeding in Teak Plantations.—Even minor improvements in the technique of raising forest crops, reducing as they do first costs, are, apart from their scientific interest, of considerable financial value because of the long period after which the investment (with the accruing interest) can be recouped in the form of the harvested timber. Mr. A. L. Griffith, Sylviculturist, Madras, who has taken up a systematic study of the existing technique of raising teak plantations in India made a notable contribution some time back by experimentally determining the optimum size of the stumps to be used in the stump-planting of teak. He has followed this up by a well-planned critical investigation into the weeding methods in the formation of teak plantations (*Indian Forest Records*, New Series, Sylviculture, Vol. IV, No. 2). His results demonstrate (for the particular soil and climate type in which the experiments were made) the superiority of "Weeding by Scraping" over four other methods in current usage. This conclusion was drawn from significant data revealed by statistical analysis. Mr. Griffith's study in weeding could well serve as a model, both in the well-defined objective of the experiments as well as the design of the experiments, for Sylvicultural research workers in India.

EMMENNAR.

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Water Content of Trees.—Forming the introductory part of his *Studies in Tree Physiology*, Dr. R. Darnley Gibbs has an interesting paper on the "Water Contents of Certain Canadian Trees" (*Canadian Journal of Research*, 1939, 17, 460). The investigation was originally started to obtain information on the seasonal changes in water content of trees. This was needed in connection with efforts to minimise the loss of logs during transport by raft flotation. Dr. Gibbs' preliminary investigation showed that (i) in the soft woods examined (Jack Pine, White Spruce, Balsam Fir) there is little evidence of seasonal change; (*ii*) in the case of paper Birch and Poplar there is a spring maximum of water content when the trees are practically full of water; this coincides with the swelling and breaking of the buds: (*iii*) following leaf opening there is a rapid decrease in water content, which continues until August or September; this reduces the amount of water in the tree to little more than half the spring value; (*iv*) after leaf fall the water content rises; (*v*) the distribution of water in Birch and Poplar is consistent with the tension hypothesis of the ascent of Sap; and (*vi*) girdling, as a means of reducing water content, is effective only if a complete ring of sapwood be removed.

Dr. Gibbs is continuing his investigation into other cognate problems in tree physiology.

EMMENNAR.

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Study on Lettuce.—Lettuce (*Lactuca sativa*) has lately been the subject of a critical study at the *Forest Research Institute*, Dehra Dun. Dr. Stebbins, Assistant Professor of Geretics,

University of California, who made the study with the aid of specimens from the Herbarium of the *Forest Research Institute*, has re-arranged the species as known in the *Flora of British India*, and added one more species to those hitherto known. The results of the study are now published in "Notes on some Indian species of Lactuca", just brought out in the *Indian Forest Records* (New Series), Botany.

There is little connection between the lettuce as grown in gardens and its relatives of the same genus found wild in the Himalayas. Dr. Stebbins, however, draws attention to the interesting fact that all species native in the Himalayas have the basic haploid chromosome number, 8, while those which have entered India from the West have the basic number 9. The significance of this fact is not yet understood.

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Measurement of Gloss, Transparency and Colour.—The details of a new apparatus for the measurement of gloss, transparency and colour, devised by Mr. N. N. Murty, of the *Indian Lac Research Institute*, appear in the recently published Bulletin, No. 37 of the Indian Lac Research Institute.

In this apparatus the source of light and the device for measuring the reflected light are located in fixed positions and subtend a right angle at the centre of the test surface which can be rotated so as to vary the angle of incidence. Measurements taken at various angles of incidence consist of light values for specularly reflected light at 45° angle of incidence and for diffused light in a direction perpendicular to the incident beam at other angles of incidence. When these are plotted against the angles of incidence, curves are obtained which have similar shape to those obtained with goniophotometers. The shape of these curves depends upon the gloss of the surface under test and can be looked upon as 'gloss pictures'.

An instrument ('Glossograph') for self-recording of such curves has been devised by directly coupling the axis of a motor-driven drum camera with that of the rotating panel of the glossometer.

The procedure for measuring the transparency of varnish films has been described; and the procedures for colour and colorimetric measurements have been indicated.

The advantages claimed for the instrument are that it combines three apparatus in one, and in measuring gloss, follows closely the procedure common to most people in the visual judgment of gloss.

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Sulaiman's Predictions.—The following is the full extract of a letter dated December 11, 1939, to Sir Shah Sulaiman from Prof. A. Michailov of Moscow. Sir Shah has kindly sent it to us for publication:—

"At last I am able to give the definite results for the deflection of light observed by me during the solar eclipse of June 19, 1936. You were right in cautioning that the terms of second order can be of influence in the reduction of the plates. One of the plates showed indeed the effect of a tilt, which had to be eliminated by introducing second order terms. Moreover, an arithmetical error was detected in the preliminary result, that I quoted to you in my last letter. I obtained the following values.

"Two of the eclipse plates were measured twice with different comparison plates.

Eclipse plate	Comparison plate	Deflection
No. 2	No. 5	2·44
,, 2	,, 6	2·42
,, 4	,, 5	2·85
,, 4	,, 6	2·93
Mean	..	2·72 ± 0·21 p.e.

"Of course the result is rather poor, as the nearest star to the sun's limb that could be measured was 31′ from the centre of the sun. In all only 25 stars could be measured. I must state, that your anticipation that a value much larger than Einstein's is to be expected gives me more confidence in publishing my results. In a short time a full account of the work shall go to press."

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Raw Materials and Foodstuffs.—There was never a moment in history at which information about supplies and sources of raw materials and foodstuffs was more urgently and more generally sought than to-day.

The volume entitled *Raw Materials and Foodstuffs Production by Countries*, 1935–1938, which has just been published by the *League of Nations*, will meet a very real need. It brings together in a handy form information which previously could only be obtained by much research. Indeed, the volume contains the most complete statistics ever published on the production of raw materials and foodstuffs, by countries. The information relates to some 200 different commodities and nearly 140 countries or areas.

The tables are so compiled that the complete production of any country can be seen by a glance at a single page.

* * *

Co-ordination of Transport.—The League of Nations has just published an interesting addendum to the volume recently issued under the title "Co-ordination of Transport".

It contains a highly instructive summary of the particulars supplied by Governments of the ways in which they were proposing or endeavouring to solve a problem which since the rather haphazard development of the motor industry and of road transport had almost everywhere become acute.

The two companion volumes contain an account of the evolution of this vast problem up to the outbreak of the present war.

The interest of this publication is due both to the data it contains and to the fact that it covers forty countries all over the world and so gives a truly international survey of the situation.

Clove Cultivation in India.—The question of undertaking clove production in India is under consideration of the *Imperial Council of Agricultural Research* in consultation with the Governments of Madras, Travancore and Mysore.

The preliminary enquiries of the Imperial Council of Agricultural Research have shown that before clove production can be undertaken on a large scale, more knowledge is necessary, requiring a series of co-ordinated experiments in Madras, Travancore and Mysore for an adequate supply of clove seed.

Such experiments are needed on nursery practice including the raising of seedlings and the possibilities of vegetative propagation; plantation practice including transplanting, spacing in the field, care of young plants, intercrops and inter-culture, manuring, and the taking of the first and succeeding crops; and protection of the plants in the field against pests and diseases.

The proposals under consideration include suggestions for ensuring an adequate supply of seed and seedlings for the experiments, and a general programme for the cultivation experiments keeping in mind the practical object of the experiments.

The Governments of Madras, Travancore and Mysore have been asked whether they can cooperate in the scheme, and to state what facilities in the way of land, labour and equipment they can provide, so that a suitable design of identical experiments for the three Governments can then be designed by the Agricultural Commissioner with the Government of India, in collaboration with the Directors of Agriculture concerned.

* * *

The possibility of manufacturing newsprint paper in India is indicated as a result of the successful investigations carried at the **Forest Research Institute**, Dehra Dun. Owing to difficulties of obtaining suitable raw materials for the production of mechanical pulp, the manufacture of newspaper print has not hitherto been attempted in this country. It has now been shown that suitable pulp can be obtained from *Kydia calycina* (*bendi* or *pola* wood) and by employing a mixture of 70 per cent. mechanical pulp and 30 per cent. bleached bamboo pulp, paper of satisfactory quality has been prepared on the experimental plant at the Forest Research Institute. The paper has been employed for printing *Dehra Advertiser* (Vol. 2, No. 5), with very satisfactory results. Where plentiful supplies of *Kydia calycina* are assured and cheap power available, the manufacture of newsprint and cheap printing paper is an attractive proposition. India imports annually 38,000 tons of newsprint valued at about 62 lakhs of rupees.

* * *

Reorganisation of the Institute of Plant Industry, Indore.—At its last meeting held at Coimbatore in January 1940, the *Indian Central Cotton Committee* accepted the proposals of the special Sub-Committee for reorganising the Institute, as a result of which, fundamental researches on genetics and plant physiology would be separated from the other work of the Institute and treated as a separate scheme under the direct control of the Committee. The work of the Institute which will be controlled by a Board of Governors and financed by joint contributions of member States of the Institute and the Committee, will be confined mainly to the breeding of cotton and other crops, seed multiplication and distribution, demonstration and propaganda and such agronomical and chemical work as may be considered desirable in the interests of the member States. The reorganisation will take effect from April 1, 1940.

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Public Health in India.—Colonel Sir Alexander Russell's report on public health in India for the calendar year 1937 is a *compendium* on public health and deserves close study. It is divided into two volumes, Volume I being the report proper and Volume II dealing with the health of the Indian Army.

Volume I deals with the history of chief diseases, including tuberculosis and hookworm, maternity and child welfare, public health administration, fairs and festivals, adulteration of food, housing, industrial hygiene, etc., etc. Medical intelligence and international health, including those of ports and health of jails are described. Reference is also made to the work of such voluntary organisations as the *Indian Red Cross Society*, *British Empire Leprosy Association* (Indian Council), the *International Health Division of the Rockefeller Foundation*, the *Bombay Presidency Baby and Health Week Association*, the *Karachi Health Association* and the *Health Propaganda Board*, Madras.

In Section XI, forty years' progress in public health is traced under public health administrations, the *Central Advisory Board of Health*, the *All-India Institute of Hygiene and Public Health*, Rural Health, Medical Research, Nutrition, Anti-tuberculosis work, etc.

The principal vital statistics of British India for 1937 are:—

Estimated Population	272,406,436
Density per sq. mile	358
Births—	
Number	9,388,457
Rate per mille	34·5
Deaths—	
Number	6,112,375
Rate per mille	22·4
Infant Mortality for 1,000 live-births ..	161·7
Vital Index	153·6

Both the birth and death rates show slight decreases as compared with the previous year but the net result was an increase in the estimated mid-year population of over three and a quarter millions. The average annual increase in population during the seven years from 1931 to 1937 has been just short of three millions and these years have, generally speaking, been characterised throughout by freedom from violent outbreaks of epidemic diseases.

"Repeated stress has been laid in these reports on the fact that public health cannot be regarded as an entity distinct from the general, social and economic life of the community. It is, therefore, satisfactory that the advent of the provincial autonomy and the conferment of extensive powers on Provincial Governments

have been followed in many provinces by social legislation which will undoubtedly have far-reaching effects on the economic life and general well-being of the people. Agricultural indebtedness, land tenure and industrial problems, to cite a few examples, are all receiving serious attention and, in so far as legislative and administrative action in these directions goes to raise the standard of life, these measures will inevitably help in improving the state of public health. In these annual reviews of the health conditions of India, there is little room for any detailed survey of social and economic factors, but mention is made of these wider aspects of community life in order to emphasise the necessity of viewing health problems from the widest possible angle."

P. PARTHASARATHY.

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All-India Institute of Hygiene and Public Health.—The Annual Report for the year 1938 makes the significant observation that although it is fully recognised that the country is badly in need of a vigorous and forward policy in regard to public health organisations, even the small number of technically trained personnel is unable to find employment in this national endeavour. Though they are keen to advance the health and efficiency of the people, the authorities find it difficult to launch extensive schemes for health protection because they are confronted with the magnitude of the problem on the one hand and the paucity of funds on the other. Most of the available funds are already appropriated by curative medicine, which as an organisation, is not only well established by tradition, but yields immediately demonstrable results, while the results of preventive medicine are difficult to demonstrate.

It is indeed pathetic to reflect that all the fine work that is being carried out at the Institute cannot be put into practice for want of funds. This is true of many of our other departments, universities and technological institutions. There is a colossal waste of intellectual effort in the country which could be harnessed in the service of the nation. Who is to harness it?

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Adrenaline Preparations Sold in India.—Quite a fair proportion of Adrenaline chloride solutions sold in India is below *par* in quality and sub-standard in strength.

This conclusion has been reached by the Biochemical Standardisation Laboratory of the Government of India as a result of the study of 30 representative samples of Adrenaline chloride solution (1 in 1,000 strength) obtained through the courtesy of the Heads of the Medical Administrations all over India which have been tested biologically for their purity and potency in course of an all-India Survey of the quality of drugs and medicinal chemicals undertaken by the Laboratory.

Out of 30 samples analysed, as many as 12 specimens (or 40 per cent.) were markedly below strength (*i.e.*, less than 75 per cent. in potency of a *known standard*). Amongst this lot, 7 samples showed a strength of less than 50 per cent. Two samples apparently contained only about 10 per cent. of an adrenaline-like blood pressure raising principle. Only 9 samples (or 30 per cent.) were found to agree with the potency claimed by the manufacturers.

Adrenaline has been known to lose its strength in the presence of alkali, the deterioration being accompanied by a reddish or brownish discoloration. Excess of alkali is sometimes present in the glass of certain containers (phials, ampoules, etc.) in which adrenaline has been found stored, and it is highly probable that this factor is at least partly responsible for the deterioration of the adrenaline solutions contained. Apart from a strict watch (by biological assay conducted by technical experts) on the quality of adrenaline powders from which solutions are made, manufacturers in India who are usually dependent on the supply of glass containers from outside should, therefore, do well to test the alkalinity of glass containers before putting in solutions of adrenaline chloride.

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Botanical Society of Bengal.—At the Annual Meeting held on 3rd March 1940, Professor S. P. Agharkar was elected President of the Society. Prof. S. C. Mahalanobis, Prof. S. C. Banerji, Mr. S. N. Bal and Dr. K. P. Biswas were elected Vice-Presidents. Mr. S. N. Banerji and Dr. S. M. Sircar were elected Hon. Secretaries.

* * *

India's Fish Industry.—Survey work on fish marketing under the direction of the Agricultural Marketing Adviser to the Government of India has been started in the Provinces and a report thereon is expected shortly.

Before practical measures can be taken to put the industry on a sound footing, it is necessary to carry out local surveys of the amount and class of fish available and systematic experimentation on small business scale with such improved methods of collection, transportation and handling of fish as are available in the country.

The Imperial Council of Agricultural Research has accepted schemes for the investigation of certain problems connected with the fishing industry and funds have already been provided for a small scheme for the investigation of the life-history of certain fresh-water fishes in Bengal.

A larger Madras Scheme for the development of the fishing industry has been approved, but funds are not yet available. The Orissa Government has submitted a scheme for carrying out biological investigations in the Chilka lake fishery and this was awaiting the consideration of the Council at the end of the year under review.

INDUSTRIAL NOTES

The occurrence in Kaladgi sandstones and in quartzites of Ratnagiri District and Savantvadi State, Bombay, of sand suitable for glass making has been reported by the *Geological Survey of India*. In the Vengurla-Savantvadi road, deposits of white sand, practically free from iron, have been discovered, and analysis of the sands has revealed that they satisfy some of the requirements of the glass industry.

The Geological Survey of India also reports the occurrence of (1) illeminite in small quantities in the bay, south of the port of Ratnagiri, (2) large deposits of potash felspar suitable for the ceramic industry near Kadaval in the Bombay Presidency, and (3) rich deposits of bauxite in the Baihar plateau in the Balaghat District and near Katni in the Jubbulpore District, Central Provinces.

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Fatigue Strength of Crankshafts.—The Institute of Automobile Engineers, is investigating the fatigue strength in bending of crankshafts for compression-ignition engines, since bending fatigue failures have been experienced in service. The information obtained is, however, proving of value in the design of all types of crankshaft.

Three machines are in use. These machines apply reversed bending moments to the specimens, which are usually multi-throw crankshafts, one throw being broken at a time. The deflection is applied through a variable throw eccentric, and is calibrated in terms of bending moments. Failure occurs across the web, the crack starting from a fillet, and the nominal stress figure is calculated in the ordinary way from the modulus of the area of fracture. The fatigue limit is determined on a basis of ten million repetitions.

A good deal of work has been carried out on these machines to study the fatigue strength of various designs of shaft in relation to the material employed. Recently, attention has been devoted more especially to various methods of surface hardening, including nitriding, chromium-plating, etc. In addition, owing to the importance under war-time conditions of salvaging worn parts for further use, a study is being made of the effect of certain processes, such as metal-spraying, for building up crankshafts.

* * *

Indian Institute of Science, Bangalore.—In the course of his speech inaugurating the Founder's Day Celebration on the 3rd March 1940, Prof. K. Aston referred briefly to the benefits bestowed by the late Mr. J. N. Tata on the whole of India by his multifarious activities in the world of Industry and Commerce.

"The legacies he has left to the nation, the number of people for whom he has provided employment and livelihood in the manufacture of steel, cotton goods and the supply of electric power are too well known to require elaboration on this occasion, but it must be said that the magnitude of these enterprises can only inspire a feeling akin to awe in contemplating the genius of the man who was responsible for the building of, what we can now see was, the sure foundations of these organisations.

Not only was he a business genius, it is also universally acknowledged that the conception of the idea in his mind of an Institute of this nature was, at that time evidence, of his vision and foresight in other directions also. This is clear from the fact that it was only some years later that similar movements were thought of in other more developed countries.

Not only do we owe to him the formulation of the idea but also the bulk of the means whereby the idea was carried into effect.

To all of us, who are privileged to work in these ideally constructed surroundings, he bequeathed an Institute of which we may well be proud and which would be the envy of many 'less blest than we', if they could but see it.

In the scope of its activities and particularly in its all-India character he has made wise provisions which are conducive to the building up of a great tradition and it should be our clear duty to devote the whole of our energies to the fostering of this tradition, however big or however small the part may be that we are called upon to play.

The Founder has provided the materials but we must do the building.

This duty is, at least in part, all pleasure. By that I mean that it is a great joy to me and to all other staff members to bring together young men from all parts of India and to see them becoming welded together into one large family."

* * *

Lucknow University.—Miss C. Virkki, M.Sc. (Lucknow), has been declared eligible to the Degree of PH.D. (Lucknow). She presented a series of important papers on the *Glossopteris* flora, which form a significant contribution to the work engaging the attention of the Botany Department of the Lucknow University, under the guidance of Professor Birbal Sahni, F.R.S. Within the last few years, as the result of post-graduate researches in the department, several students have obtained the PH.D. and D.Sc. Degrees.

* * *

University of Mysore.—*February* 1940: The following University Extension lectures were delivered:—(1) Mr. J. P. Das, B.A., M.Sc., A.M.I.E.E., M.I.E., Professor of Electrical Engineering, College of Engineering, Bangalore, on "The Electrical Age", in Kannada, at Dodballapur. (2) Mr. W. G. Eagleton, M.A., Professor of English, Maharaja's College, Mysore, on "The Civilisation of France", in English, at Bangalore. (3) Mr. A. Narayana Rao, M.Sc., Lecturer in Zoology, Central College, Bangalore, on "Defence in Nature", in Kannada, at Hassan and on "Biology and Human Life", at Holenarasipur. (4) Mr. D. S. Mallappa, Director, The Mysore Bank, Ltd., Tiptur, on "Social Legislation", in Kannada, at Davangere.

ANNOUNCEMENTS

New Harmone Standards for International Use.—The Third Conference on the Standardisation of Hormones, organised by the Commission on Biological Standardisation (League of Nations) dealt with the standardisation of the anterior lobe of the pituitary gland and similar principles contained during gestation in urine and blood serum.

The international standard of gonadotrophic hormone, extracted from the human urine of pregnancy, established last year by the Standards Department of the Institute for Medical Research of Hampstead (London), has already been distributed by that Department for international use. Two new standards are now ready for delivery: the lactogenic hormone

of the anterior lobe of the pituitary gland and the gonadotrophic hormone extracted from the urine of pregnant mares.

The Biochemical Standardisation Laboratory, Calcutta, which has been appointed by the Government of India as a "National Centre" for the distribution of standard preparations of biological products holds these standards on behalf of the *League of Nations* and sends them on request, free of charge, to any *bona fide* research institution or commercial organisation. The Laboratory also gives all relevant information regarding the standards to those who are interested in their use.

Scripta Mathematica has available for *free* distribution a portrait of Pythagoras reproduced from a fresco by Raphael, also a beautifully printed biography of Pythagoras by Professor Cassius Jackson Keyser (reprinted from his *Portraits of Famous Philosophers who were also Mathematicians*). These may be obtained by writing to *Scripta Mathematica*, Yeshiva College, 186th Street and Amsterdam Avenue, New York City and enclosing 10 cents for postage.

Indian Central Cotton Committee.—The next triennial Conference of Scientific Workers on Cotton will be held at Surat in January 1941.

Enzymologia.—It is announced that from Volume VII onwards the *Journal* will also take up the border zones of pure enzymology, namely, all biocatalysts; *e.g.*, besides the enzymes proper, chlorophylls, vitazymes, hormozymes (animal and plant), toxozymes, viruses, organizers, genes, etc. Only experimental papers of chemical or biological content can be accepted, not pure pathological or clinical work.

Uses and Applications of Chemicals and Related Compounds.—In the review appearing in the February issue of this *Journal* (page 82) the sentence commencing with "Sales executives, research directors" and ending with the word "available" has suffered in grammar and meaning for which the author is not responsible. His statement is now reproduced.

"Sales executives, research directors, manufacturers, dealers and others, who are naturally interested in the present-day uses of the several chemical products, each from his respective point of view, and who would have found it difficult hitherto to obtain the required information from the much scattered published literature, have now the advantage of consulting a single book which contains all the necessary references."

Biological Control in the Lac Industry.—Our attention has been drawn to a statement occurring in a note on this subject (*Curr. Sci.*, 1939, **8**, 537) to which Messrs. Glover and Gupta, on whose contribution the comment is made, have objected. The statement runs thus: "The emphatic statement that the damage done by parasites is small (4·8 per cent.) may be questioned by other experienced workers in the field, whose work as is customary with these authors, has been ignored. They refer to the 'recently discovered egg parasites of lac predators' the practical demonstration of whose effectiveness will be awaited with keen interest". The two sentences are in our judgment perfectly fair, except perhaps the adjectival clause in the first which may be considered offensive by hypersensitive authors. Our reviewer at the time he wrote them, it is understood, relied on certain impressions lurking in his mind and was not aware that any damage to the reputation of the authors for their integrity would be involved. The appearance of the objectionable clause is, however, regretted and it is withdrawn. We trust that Messrs. Glover and Gupta will accept our explanation in the spirit in which it is offered.

The attention of our readers is drawn to an advertisement appearing in the February number of *Current Science*, inviting applications from duly qualified chemists for the post of Works Superintendent, The Mysore Chemicals & Fertilisers, Ltd. Applications should reach the Secretary, The Mysore Chemicals & Fertilisers, Ltd., 1128, Vani Vilas Road, Mysore, on or before the 31st March 1940.

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We acknowledge with thanks receipt of the following:—

"Journal of Agricultural Research," Vol. 59, No. 8.

"Agricultural Gazette of New South Wales," Vol. 51, Pt. 2.

"Journal of the Royal Society of Arts," Vol. 88, Nos. 4545–51.

"The Philippine Agriculturist," Vol. 27, No. 9.

"Monthly Bulletin of Agricultural Science and Practice," Vol. 31, No. 1.

"Nagpur Agricultural College Magazine," Vol. 14, No. 3.

"Indian Journal of Agricultural Science," Vol. 9, Pt. 6 and Vol. 10 Pt. 1.

"L'Agricultura Coloniale," Vol. 33, Nos. 11 and 12.

"Allahabad Farmer," Vol. 14, No. 1.

"Biochemical Journal," Vol. 33, No. 12.

"Journal of the Institute of Brewing," Vol. 46, Nos. 1 and 2.

"Journal of Chemical Physics," Vol. 7, No. 12 and Vol. 8, No. 1.

"Journal of the Indian Chemical Society," Vol. 16, No. 12.

"Journal de chimie physique," Vol. 36, Nos. 10–12.

"Comptes Rendus (DOKLADY)," Vol. 25, Nos. 6–8.

"Indian Forester," Vol. 46, No. 2.

"Transactions of the Faraday Society," Vol. 36, Nos. 225 and 226.

"Review of Applied Mycology," Vol. 19, No. 1.

"Indian Medical Gazette," Vol. 75, No. 2.

"Nature," Vol. 145, Nos. 3663–67.

ACADEMIES AND SOCIETIES

Indian Academy of Sciences:

February 1940. SECTION A.—S. S. PILLAI: *On m Consecutive Integers—II.* V. SEETHARAMAN: *Methods of Generating Differential Invariants with Special Reference to Path-Spaces of Order* 2. T. M. K. NEDUNGADI: *Effect of Temperature on the Raman Spectrum of Quartz.* The lines are observed to broaden and shift to lower frequencies as the temperature of the crystal is raised over the range from liquid air temperature to 530° C. The line 207 broadens in an unsymmetrical and exceptionally enormous manner as the transition temperature 575° C. is approached. It is possible that this mode of vibration is responsible for the transition itself. SIKHIBHUSHAN DUTT AND B. M. S. AGARWAL: *Colour in Relation to Chemical Constitution of the Organic Salts and Metallic Derivatives of Isonitroso-Diphenyl-Thiohydantoin.* The change in colour of the above compound in the presence of alkali has been studied. This has been shown to be due to a fundamental change in the constitution of the molecules from an oximinoketonic to a nitrosoenolic form. P. R. SUBBARAMAN AND K. R. KRISHNASWAMI: *A Rapid Volumetric Method for Estimation of Iron and Titanium and its Application to Ilmenite Analysis.* Titration is effected with solutions of (a) ferric sulphate and (b) potassium permanganate. N. JAYARAMAN: *A Chemical and Mineralogical Study of the Feldspars from the Mica-Pegmatites of Nellore, Madras.* The feldspars could be grouped as non-perthitic, perthite-microperthite, and microperthite. There is mutual solubility, although to a limited extent, between the soda and potash feldspars and between soda feldspar and anorthite. The colour of these feldspars is not schiller colour but due to an iron compound.

February 1940. SECTION B.—JAI CHAND LUTHRA AND INDAR SINGH CHIMA: *Some studies on the metabolism and growth of Malta oranges.* PRAHLAD NARAIN MATHUR: *The venous system of the pond-turtle,* Lissemys punctata (Bonnaterre). S. B. KAUSIK: *A contribution to the embryology of* Enalus acoroides (*L. fil.*), *Steud.* M. ANANTASWAMY RAU: *An embryological study of* Suriana maritima *Linn.* D. SRINIVASACHAR: *Embryological studies of some members of Rhamnaceæ.*

Indian Association for the Cultivation of Science (*Proceedings*):

November 1939.—HAZARILAL GUPTA AND ABINASH CHANDRA: *Evaporation from earthen jugs.* SH. NAWAZISH ALI: *Absorption spectra of compounds of phosphorus.* F. C. AULUCK: *Linear extension of reflected image produced by a surface traversed by waves.* P. C. MAHANTI AND A. K. SEN GUPTA: *Isotope effect in Band Spectrum of tin monoxide.* SACHINDRA MOHAN MITRA: *On the polarised fluorescence of organic compounds.*

Mining, Geological and Metallurgical Institute of India:

December 1939.—A paper of great industrial importance dealing with the possibilities of manufacturing Carbon Electrodes in India by Dr. D. Swarup, Mr. V. G. Iyer, and Mr. A. H. K. Iyer, appears in the *Transactions* of the Institute (Vol. 35, No. 3). After giving a brief introduction regarding the nature of the raw materials required, the authors have investigated the possible sources of these materials in India, and their use in the manufacture of the different types of electrodes. A detailed description is then given of the several processes involved in this work, together with estimates of probable cost. At the conclusion of the paper, there is the Report of a valuable discussion on the several points raised by the authors in the course of their communication, which serves to draw our attention to other aspects of the problem.

The *Journal* also contains a paper on "The correlation of the Satpukuria Seam in the Raniganj coal-field" by Mr. M. M. Mukherji, on which Mr. E. R. Gee contributes a valuable Note.

Society of Biological Chemists, India:

January 30, 1940.—C. V. GANAPATI: *Coagulation of Milk by Enzymes.*

February 9, 1940.—DR. B. ANANTHASWAMY RAO: *Biological Methods of Malaria Control.*

March 4, 1940.—P. L. N. RAO: *Chemotherapy of Selenium and Tellurium Compounds.* P. R. VENKATARAMAN : *Water-soluble Nitrogen of Garlic* (Allium sativum). C. V. GANAPATI: *Nature of the Milk-clotting Enzyme in Papain.*

Entomological Society of India (Bengal Branch):

February 15, 1940.—D. P. RAICHOUDHURY AND DINESH CH. SARKAR: *Determination of the percentage of mortality in Bengal silk worm* Bombyx mori *L. (Nistid variety) and the effect of seasonal changes.* The author dwells on the effect of temperature and humidity as recorded by maxima and minima thermometers and dry and wet bulb thermometers day to day throughout one year. The observations were made on the larvæ reared in the laboratory from disease-free and healthy moths. The authors concluded that high temperature was inimical to the growth of the silk worm at the last larval stage when the highest mortality occurred.

Meteorological Office Colloquium, Poona:

December 19, 1939.—DR. A. L. NARAYAN: *A new photo-electric micro-photometer for the measurement of the contours of spectral lines.*

February 13, 1940.—C. W. B. NORMAND: *The International Meteorological Meetings at Berlin in June* 1939.

February 20, 1940.—N. K. SUR: *The results of sounding balloon ascents during a depression in July* 1937.

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